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Internal rural migration and marginality: the case of Agusan del Sur, Philippines

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The case of Agusan del Sur Philippines

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Dissertation présentée
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Migrations internes et marginalité.
Le cas d'Agusan del Sur, Philippines.
par Nicolas Daix

Résumé: Dans de nombreux pays du Sud, les migrations humaines constituent une réelle stratégie de survie. A côté des migrations internationales – qui concernent plus de 200 millions d'individus au niveau mondial – les migrations internes, c'est-à-dire au sein d'un seul et même pays, concernent davantage de personnes. Dans la formulation des Objectifs du Millénaire, les Nations-Unies ont pris en compte ce phénomène. Elles considèrent que la compréhension et la bonne gestion de ces mouvements migratoires forment un levier dans une stratégie de réduction de la pauvreté. Parmi les migrations internes, les migrations vers les zones rurales sont conséquentes et largement étudiées. Cependant, les impacts liés à l'arrivée de migrants dans une région rurale – impacts autres qu'environnementaux, lesquels sont bien documentés – sont nettement moins étudiés. Finalement, le rôle des migrations concernant le développement de la région hôte (rurale) est aujourd'hui assez flou et ce genre d'études constitue aujourd'hui un réel challenge. Le développement est souvent réduit à sa seule dimension économique et généralement associé au phénomène de pauvreté. L'étude de la marginalité – comprise comme le résultat de facteurs économiques, politiques et spatiaux – nous apparaît ici plus appropriée.

L'objectif majeur de cette thèse est de contribuer à une meilleure compréhension des liens existants entre immigration rurale et marginalité. La province d'Agusan del Sur, étudiée ici, est l'une des provinces les plus pauvres des Philippines. Cette province a connu une arrivée massive de migrants, essentiellement depuis les années soixante. Très convoitée de par la richesse de son capital naturel (forêt, ressources minières, fertilité du sol), elle a également vu son paysage se modifier en profondeur au cours des cinquante dernières années.

Précisément, cette recherche s'attache tout d'abord à clarifier le concept de marginalité. Une formulation conceptuelle est proposée. Sur base de données socio-économiques provenant de l'administration locale, nous utilisons les résultats d'une Analyse en Composantes Principales (ACP) pour quantifier la marginalité de chaque village au sein de la province. L'isolement par rapport aux petits centres urbains semble structurer spatialement la marginalité. Cette structuration est telle que certains facteurs de marginalité intrinsèques aux villages ne peuvent être capturés par l'indicateur de marginalité. Un indicateur de marginalité endogène est donc proposé sur base d'une modélisation de la marginalité en fonction de l'isolement spatial afin de mettre en évidence ces éventuels facteurs endogènes.

La marginalité et la marginalité endogène de chaque village étant caractérisées, des facteurs explicatifs sont recherchés. A l'échelle de la province deux facteurs démographiques sont mis en évidence : tant la taille de la population que la proportion d'immigrants sont inversement corrélées à la marginalité. En d'autres termes, plus il y a d'habitants dans un village et/ou plus il y a d'immigrants, moins le village est marginalisé. D'autres facteurs explicatifs sont recherchés en intégrant les données spatiales dans un Système d'Informations Géographiques (SIG) et en utilisant notamment des techniques de télédétection (LUCC, NDVI), une analyse de corrélations, une analyse d'associations spatiales (LISA) ou encore une Analyse Factorielle des Correspondances (AFC).

Internal Rural Migration and Marginality
The Case of Agusan del Sur (Philippines)
by Nicolas Daix

Abstract: In many developing countries, human migration is a real strategy of survival. In addition to international migrations - that affect more than 200 million people worldwide (OECD, 2008) – internal migrations (within the same country) affect even more people – about 330 million people according to United Nations (UNESC, 2009).

In formulating the Millennium Development Goals, the UN took into account the phenomena above. The understanding and the management of these migratory movements constitute a strong leverage in poverty reduction strategies. Among internal migration, the migrations towards rural areas are substantial and quantitatively widely studied. Nevertheless, the impacts associated with the arrival of in-migrants in a rural area – out of the environmental impacts, which are well documented - are poorly studied. We know relatively little about the role of in-migration on the rural host region's development. This kind of study constitutes a real challenge today. Development studies are most often focusing on economic perspectives while they generally associate development with poverty. The study of people's marginality – as a result of economic, political and spatial factors – is perceived as a valuable contribution to the broad impact of internal migration. The marginality concept itself remains quite unclear and controversial.

The main objective of this thesis is to contribute to a better understanding of the existing linkages between rural in-migration and marginality.

Agusan del Sur Province (Philippines) has been selected as a case study due to its poverty and migration characteristics. This province has experienced several in-migration flows since the 1960s. As "Promise Land" of The Philippines in terms of prosperous natural capital (forests, mineral resources, soil fertility, typhoon free), the province has seen a tremendous landscape and population change for the last fifty years. Strong in-migration marginality and land use change linkages are suspected.

The current research starts with the clarification of the concept of *marginality*. Based on the socio-economic data from local government, the Principal Component Analysis (PCA) outputs are used to quantify the marginality level for every village in the province. Specific attention is paid to the remoteness of all villages from towns with a view to infer a spatial structure for the marginality. An *endogenous marginality* indicator is suggested to highlight some possible strict endogenous factors. Global marginality and endogenous marginality being specified and captured, the major explanatory factors are explored, such as the population size, the proportions of in-migrants, their socio-demographic profile, some environmental variables. Remote sensing techniques (LUCC, NDVI), correlation analysis, local analysis (LISA) and Factorial Correspondence Analysis (FCA) in connection with Geographical Information Systems (GIS) represent the main tools we used to highlight the rural in-migration versus marginality linkages.

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« Je ne vous écris pas ces voyages par nostalgie de l'exotisme, d'un ailleurs rédempteur, mais pour retenir des instants, des visages, des circonstances humaines et géographiques parce que là où le soleil se lève les hommes ont le même souci de vivre, de comprendre, de sourire à l'autre, d'effacer la souffrance et de donner un sens à leur existence. Les voir, les observer, les entendre est une richesse inouïe que nul ne conteste. Pourtant ce cavalier mongol en haut de la montagne, qui regarde le soleil se lever sur la vallée sans frontières, sait que le monde est là où il pose son regard et nulle part ailleurs.

Il n'y a pas d'autres territoires que celui où tu poses ton regard,
où la lumière, d'un doigt, te montre le chemin. »

Bernard Giraudeau, extrait de *Cher Amour*

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List of acronyms and abbreviations

ADS	Agusan del Sur
ARMM	Autonomous Region in Muslim Mindanao
BDP	Barangay Development Plan
Bgy.	Barangay
CADC	Certificate of Ancestral Domain Claims
CAR	Cordillera Administrative Region
CBFM	Community-Based Forest Management
CBMS	Community-Based Monitoring System
CBR	Crude Birth Rate
CBRM	Community-Based Resource Management
CCA	Canonical Correspondence Analysis
CDR	Crude Death Rate
CDW	Cost-Weighted Distance
CLUP	Comprehensive Land Use Plan
CRNI	Crude Rate of Natural Increase
DBP	Development Bank of the Philippines
DEM	Digital Elevation Model
DENR	Department of Environment and Natural Resources

dNN	Nearest Neighbour Distance
envi-PEF	Potential Explanatory Factors relative to surrounding environment
ESDA	Explanatory Spatial Data Analysis
ESSC	Environmental Science for Social Change
F1	First component
F2	Second component
FCA	Factorial Correspondence Analysis
Fig.	Figure
FLMA	Forestland Management Agreements
GDP	Growth Domestic Product
GIS	Geographic Information System
HDI	Human Development Index
HH	High-High (Moran Scatter Plot)
HHs	Households
HHs-PEF	Potential Explanatory Factors relative to households
HL	High-Low (Moran Scatter Plot)
HPI	Human Poverty Index
I	Moran's Index
IFMA	Industrial Forest Management Agreements
I_i	Local Moran's Index
Ind-PEF	Potential Explanatory Factors relative to individuals
IP	Indigenous People
LGU	Local Government Unit
LH	Low-High (Moran Scatter Plot)
LISA	Local Indicators of Spatial Association
LL	Low-Low (Moran Scatter Plot)
Ln	Neperian (or Natural) Logarithm
LUC	Land Use Change
M	Index of marginality
MCA	Multiple Correspondence Analysis
MDGs	Millennium Development Goals
M_{endo}	Index of endogenous marginality
M_{endo}-2	Index of endogenous marginality (v2)
MSS	MultiSpectral Scanner (Landsat)
Muni-PEF	Potential Explanatory Factors relative to municipalities
NCR	National Capital Region
NCSO	National Census of Statistics Office
NDVI	Normalized Difference Vegetation Index
NGO	Non-Governmental Organizations
NPA	New People's Army
NSO	National Statistics Office
OECD	Organisation for Economic Co-operation and Development
OFW	Overseas Filipino Workers
OLS	Ordinary Least Square
P&O	Peace and Order
PA	Philippine Army
PCA	Principal Component Analysis
PEF	Potential Explanatory Factors
PENRO	Provincial Environment and Natural Resources Office
PhP	Philippine Pesos
PICOP	Paper Industries Corporation of the Philippines
PISOS	Pump irrigation open source
PTWG	Provincial Technical Working Group
R	Remoteness
r	Correlation Coefficient (Pearson)
Tab.	Table
TLA	Timber Licence Agreements
TM	Thematic Mapper (Landsat)
UNDP	United Nations Development Programme
USD	US Dollar
WW2	World War II

N.B.: In the present document, all the maps of the Philippines, Mindanao and Agusan del Sur Province have the following coordinate system: *WGS 1984 UTM Zone 51N*.

Chapter 1

Introduction

This chapter develops the problem statement and our logic of intervention regards why we decide to study the marginality and internal rural in-migration in the province of Agusan del Sur. Scientific and geographical justifications are given, the specific objectives of the study are identified and the thesis outline is presented and synthesized through a schematic general framework.

1.1 Problem Statement

1.1.1 Scientific justification

In many developing countries, human migration is a real strategy for survival (Hugo, 1998; Kothari, 2002; de Sherbinin *et al.*, 2007). There are more than 200 million estimated international migrants in the world in 2008 (OECD, 2008) or about 3.3% of world population. This figure has more than doubled in thirty years. Besides these international migrations, internal migrations, i.e. within the same country, are even more important in people. According to UNDP there are 330 million internal migrants worldwide. Migration in China and India alone exceeds the total international migration worldwide (Deshingkar, 2006). In China, for example, the number of internal migrants was 26 million in 1988 and 126 million in 2004 (ODI, 2006). In India, they were some 309 million in 2001, approximately 30% of the national population. Facing this phenomenon, which is a global challenge, the United Nations took into account human migration in the formulation of the *Millennium Development*

Goals[1]. The January 2005 report entitled *Investing in Development: A Practical Way to Achieve the MDGs* addresses the migration at many levels. This highlights the need for a comprehensive approach of the migration management in a context of poverty reduction (IOM, 2005).

The impacts of international migration on development have been widely studied in the literature. Numerous studies have analyzed positive and negative influences of the remittances on the local economies both at origin and destination (Lucas and Starck, 1985; Gould, 1994; Taylor, 1999; Curran, 2002; de Haas, 2007). In internal migration studies, the rural to urban migration and its impacts have been studied by numerous scientists from many disciplines (sociologists, geographers, economists, etc.). While the migrations to rural areas become increasingly significant – especially because the cities are less attractive than before[2] –, very few studies have investigated such migration flows and few studies concern their impacts on the region of origin (except environmental impacts that are well investigated since the nineties). Finally, we know very little about the role of migration to rural areas on the host region development and the study of such migrations constitutes a *real challenge* today. Studies about internal migration patterns have been early considered as vital in the *planning for economic progress* (Ng, 1975). Moreover, development is often reduced to its economic dimension and associated to poverty. We affirm that development can not be reduced to this unique dimension. We suggest that marginality can be seen as the result of – regional and local – economical, spatial, social and/or political existing factors. Marginality, by its multi-dimensional and multi-scalar nature, is *more than poverty* and we believe that this concept is more appropriate for the analysis of *migration-development nexus*. In the present study, we are therefore mainly focusing on the impact of human in-migration on the marginalized populations in rural areas.

While many studies have investigated the motivations of migrants, both in-migrants and out-migrants (for instance Lucas, 1997; Henry *et al.*, 2002), and the impacts on the sending areas (Bilsborrow *et al.*, 1987; Beauchemin and Schoumaker, 2005), only few have captured the impact of in-migration on the marginality of the receiving areas (or *host areas*). Specifically there is a real *dearth of knowledge* about internal population movements within the Philippines since the 1990s (Gultiano, 2004).

The present study hopes to constitute a contribution to fill up the gaps in the existing scientific literature on the basis of a reference case study.

[1] See the report entitled *The Millennium Development Goals and Migration* (IOM, 2005) for a global analysis of the inter-linkages between MDGs and migration in particular poverty eradication, gender, health, sustainable environment and global partnerships.
[2] Most urban growth over the next 25 years will not indeed take place in mega-cities at all but will occur in far smaller cities and towns (Cohen, 2004; Cohen, 2006).

1.1.2 Geographical justification and selection of a research pilot site

In the Philippines (89 million inhabitants in 2007[3]), like international migration, internal migration is a strategy of survival for many decades. Much of the country's labor force indeed works in the primary sector, particularly in agriculture. For various reasons, including demographic, environmental, economic and political reasons, huge numbers of Filipino families are living below the poverty line[4]. If they do not move to cities hoping to find a job, those families are looking for some land that will allow them to get to a better living standard.

The island of Mindanao (a location map is given at figure 1.1 below) in the south of the Philippine archipelago, had been considered as the *Promised Land*[5] for a long time. The island has experienced significant waves of in-migration during the second half of the twentieth century. "Frontier areas are important locations for the study of migration, given their important differences, vis-à-vis long-settled areas" Barbieri *et al.* (2008, p. 292) say. At the beginning of the last century, large areas of primary forest, as well as the population density were still low within Mindanao. Several tens of thousands of peasants, mostly coming from Visayas islands, settled in the island, fleeing from socio-economic hardship and even armed conflicts.

The province of Agusan del Sur (ADS), Northern Mindanao Region, is one of the poorest provinces within the country. It continues to host a lot of migrants and, according to the local statistics, the poverty situation of the provincial population does not improve. As a start, we decided to make it our case study.

The province of Agusan del Sur constitutes a key region. It is covered by the *Timber Corridor of the Philippines*. Caraga Region – including ADS – supplies about 65 to 70 percent of the country's lumber needs[6]. Poverty is often observed in such forest environments (Inogushi *et al.*, 2005; Soriaga and Walpole, 2006; FAO, 2008). The forest is indeed a major component of a complex system linking *Population and Environment*. Mindanao forest areas are highly coveted because of the abundant natural resources that they contain (wood for logging, mineral for mining, non-wood products, etc.). Moreover, logging and slash-and-burn are necessary to develop farming and to ensure subsidence of local populations. Most of the provincial

[3] Source: National Statistics Office, Republic of the Philippines.
[4] In 2006, 22.6 % of Philippine population is living under 1.25$ (PPP) a day, 45 % under 45$ (PPP) a day and 25.1 % living below national poverty line in 2003 (12,475 PhP according to the National Statistical Coordination Board) (UNDP, 2008).
[5] In particular because a large part of the island is typhoon free and the availability of land remained important for a long time.
[6] The establishment of timber corridor is one of the strategies of the government aimed primarily to identify and set aside permanent forest areas which can be suitably managed and developed into plantation for the production of timber and non-wood products to support the forest based processing facilities and related industries for domestic and foreign markets. The CARAGA area is prioritized as timber corridor because of its biophysical conditions (Carandang, 2005).

population works in the primary sector[7]. The degradation of forest cover, exacerbated by rapid population growth, is frequently seen as a disruption of the existing man/nature ancestral equilibrium. The negative effects of the deforestation are frequently mentioned (depletion of water quality and soil quality, increasing of landslides risk, etc.) (Guthrie, 1997; Dai *et al.*, 2002; Hartanto *et al.*, 2003). Forests, especially the tropical forest of the Philippines, are hosting thousands of people, including indigenous communities[8]. Peace & Order (P&O) problems and the local political context do challenge the forest as a real *social substratum*.

1.1.3 A first step towards action

In addition to the scientific and geographical interests mentioned above, the characterization of migration and marginality dynamics and structures within the province will provide key information in the development of local consistent policies. A better knowledge of target populations indeed and the impacts of the communities of Agusan del Sur (migrants and non-migrants) on their natural and economic environments may make the government land use policies more effective. According to Deshingkar (2006), better information on migration and its potential role regards the poverty reduction and is likely to lead to a change in official attitudes, and to help in fostering a better understanding of the ways in which policy can both support migration and respond to its effects. This challenge is even greater as most of the anti-poverty strategies do not refer to migration (de Haan and Yaqub, 2008).

[7] Based on the 1995 census, 75% of the provincial labor force is engaged in agriculture and forestry.

[8] The population data regarding the indigenous peoples in the Philippines vary according to who has conducted the research (Molintas, 2004) from 6.5 million (Maaka and Andersen, 2006) to 15 millions (TABAK, 1990). According to Cruz *et al.* (1988) 6 millions IPs were living within the forestlands in 1988.

Fig. 1.1 – The Philippines and its regions

1.2 Objectives of the study and research questions

The **general objectives** of this study may be formulated as follows:

- to contribute to a better understanding of the impacts of internal in-migration on the marginality within a rural context;
- to investigate how spatial analysis techniques and tools can be used to identify structures and dynamics of such a phenomenon.

In order to achieve all these goals, the following **specific objectives** will be addressed:

Specific objective 1
To have a deep understanding of the global socio-economic and environmental context

- *Q1.1 How have socio-economic and environmental contexts evolved for recent decades?*
- *Q1.2 What are the observed social changes during these last decades?*

Specific objective 2
To investigate the concept of marginality

- *Q2.1 What is marginality?*
- *Q2.2 What would be possible mechanisms of marginality in the Agusan del Sur context?*
- *Q2.3 Are there several types of marginality?*

Specific objective 3
To develop statistical techniques for assessing marginality levels

- *Q3.1 What is the level of marginality within the province?*

Specific objective 4
To identify and analyze the spatial distribution of migration and marginality

- *Q4.1 Where are the in-migrants located in the province?*
- *Q4.2 What are the driving factors of their in-migration?*
- *Q4.3 Is there any spatial structure in the in-migrants distribution?*
- *Q4.4 Is there any spatial structure in the marginality level distribution?*

Specific objective 5
To identify, through statistical and spatial analysis, the potential driving factors of marginality

- *Q5.1 What are the driving factors of the observed marginality?*

1.3 Thesis outline

The **present chapter (Introduction)** develops the problem statement and our logic of intervention regards why we decide to study the marginality and internal rural in-migration in the province of Agusan del Sur. Scientific and geographical justifications are given, the specific objectives of the study are identified and the thesis outline is presented and synthesized through a schematic general framework (Fig. 1.2).

The **second chapter (Literature review)** presents a state of the art. The first part of this chapter is devoted to human migration in the South. After a description of the various types of migrations, their determinants (pull and push factors) are reviewed. A large part of this chapter is dedicated to the impacts of migration (both out-migration and in-migration). Finally, migration in Southeast Asia, and especially in the Philippines during the last century, is described. The second part of chapter 2 focuses on marginality. As this concept is linked to poverty, a review of the major studies on poverty and indicators are presented. A definition of marginality is proposed, as well as different methods for reporting this multidimensional human reality. The third part of the chapter focuses on the links between poverty, marginality and isolations (remoteness). We conclude by proposing a conceptual definition of marginality, endogenous and exogenous, that will be used in this study.

The **third chapter (Study area rationale)** describes the study area and justifies its selection. The historical and geographical contextualization of the province is essential to provide a global view of the local reality. After giving a brief background of the province of Agusan del Sur, we present its socio-economic, environmental, infrastructural and demographic contexts, as well as the main provincial concerns.

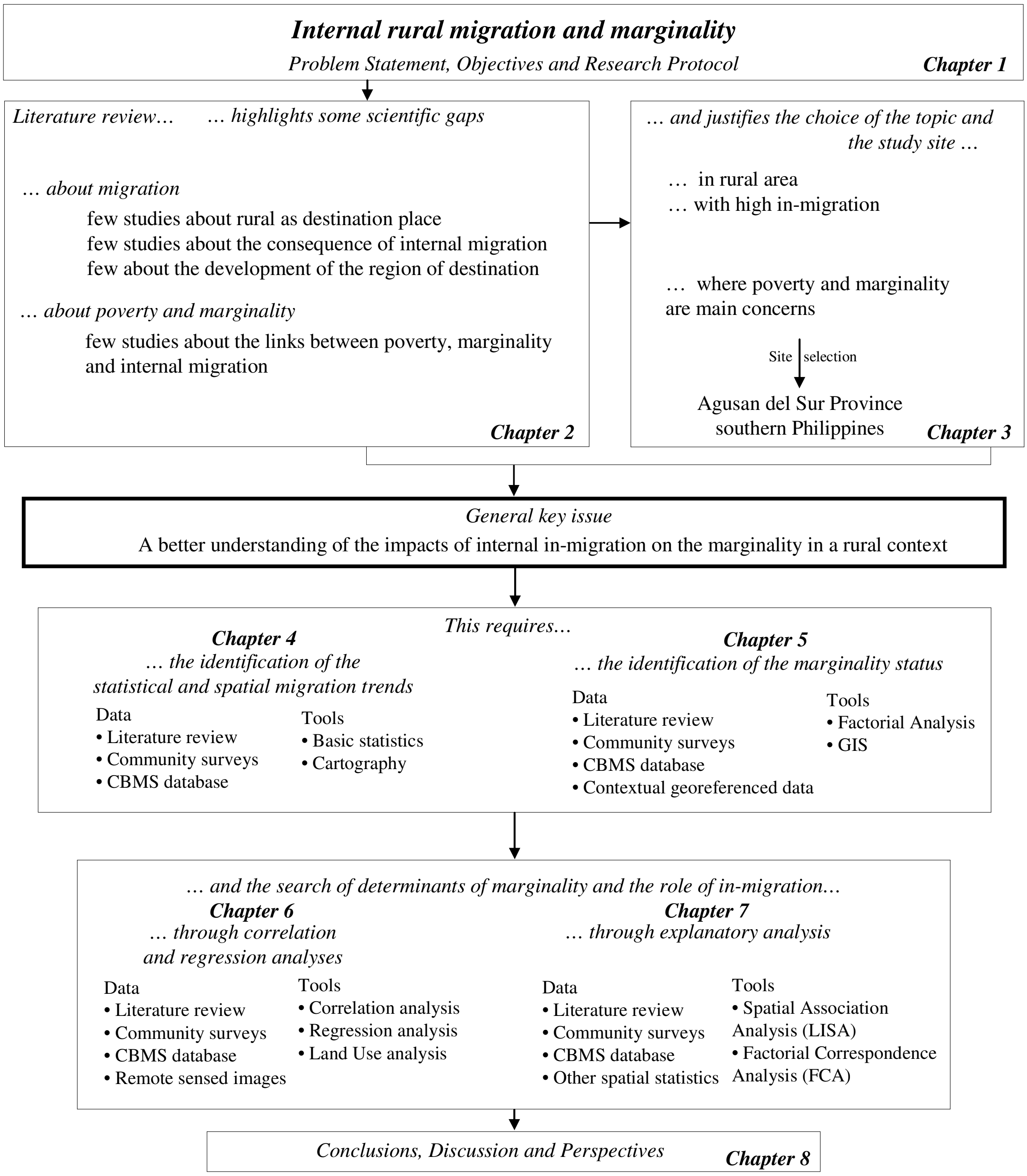


Fig. 1.2 – General framework

The **fourth chapter (Migration trends)** is about to depict the in-migration trends that the island of Mindanao and specifically Agusan del Sur Province experienced. This will help in understanding the driving factors of migration and the existing structures. A quantification of in-migration is carried out at the provincial and sub-provincial scales. Main determinants of migration are identified from the existing literature and from a field survey.

Chapter five (Marginality status in Agusan del Sur Province) is devoted to the identification of the marginality status in the province of Agusan del Sur. After the presentation of the database we used, we propose a composite index of marginality, based on the results of a Principal Component Analysis. Derived from a model that links marginality and isolation, an indicator of *endogenous marginality* is formulated by subtracting the spatial remoteness of populations in relation to economic centres.

Chapter six (Environment, Socio-economy, Marginality nexus) aims to identify the main factors of marginality (determinants) with a specific focus on the role of in-migration. As a first step, we look for environmental factors of marginality, in particular from remote sensing data. As a second step, we perform a model for the whole province aiming to prove that, besides remoteness, the underlying population size and the migration flow do affect the marginality. However, not all the determinants of marginality can be exhaustively captured.

In **Chapter seven (Marginality factors: Explanatory geostatistical analysis)** we explore other explanatory analyses tools – such as local indicators of spatial association (LISA) or Factorial Correspondence Analysis (FCA) – helpful in the identification of underlying determinants of marginality.

Chapter eight (Conclusions, Discussion and Perspectives) is devoted to the review of the thesis foundations, to the structure, and to a way of implementing the methodology. The main empirical and theoretical findings are resumed while some strengths and weaknesses of the methodology are discussed. The chapter ends with a formulation of the research perspectives, recommendations and a final conclusion.

Chapter 2

Literature review

This chapter presents a review of the literature. The first part is devoted to human internal migration. After describing the various types of migrations, their determinants (pull and push factors) are reviewed. A large part is dedicated to the impacts of migration (both out-migration and in-migration) observed in literature. We mainly focus on social and spatial impacts in the South. The second part of the chapter is focused on marginality. This concept is linked to poverty, history of studies on poverty and indicators are presented. Existing definitions of marginality are then given as well as the different methods for reporting this multidimensional human reality. The third part focuses on the links between poverty, marginality and isolations on the one hand and the links between poverty and indigenous people on the other hand. We conclude by proposing a conceptual definition of marginality.

2.1 Human internal migrations

Human migration can be of several types depending on the destination and duration: international migration[9] or internal migration (i.e. an intra-national movement of population), temporary or definitive migration. The reasons for migration can be very diverse. Peoples migrate to find work, to study, to join one or more members of the family, to escape from conflict zones or a precarious situation, and so on.

[9] The 1998 UN recommendations on the statistics of international migration define an international migrant as “any person who changes his or her country of usual residence” (UN, 1998, p.17). This type of migration will be not studied here.

Only internal migration will be included hereafter in the discussion. A typology of internal migration focused on the South is presented below in order to render the diversity of the phenomenon. Determinants and impacts of such movements are exposed later.

2.1.1 Typology of internal migration in the South

a. Urban and rural migration

Classically one distinguishes four types of migrations depending on the nature of destination and origin: rural to urban, urban to urban, rural to rural and urban to rural (Connell *et al*., 1976; Findley, 1977; Macharia, 2003).

- Migration from rural to urban areas is perhaps the best known internal migration as it is the famous *rural exodus*. People flee the rural areas to go to the cities where they hope to find a job or to return to family members or relatives. However, these migrations are not the most important anymore in most of the countries in the South (see below) (Agesa, 2004; Loi, 2005).
- Migration between urban areas are less and depend mainly on the degree of centrality (urban monocephalism or not) and the attractiveness of urban centers. We can observe this kind of migration in cases where a city, often the economic capital, has a much higher attractiveness than other cities or in a country where the system of inter-urban information is efficient (Agesa, 2004).
- Rural to rural migration still dominates migration flows in the South, and especially in most Asian countries (Guest, 2003).
- Finally, there is migration from urban to rural areas. The vast majority of these migrations are so-called *return migration*.

Recent data about the extent of these migratory patterns are rather difficult to gather. One of the fundamental impediments to cross-national comparisons of internal migration has been the dearth of available data (Bell and Muhidin, 2009). Most of the internal migration studies quantifying such patterns are often focus on the 1970-1990 period. Table 2.1 below gives an idea about the magnitude of migratory patterns for some developing countries.

Country	Year	Rural > Urban	Urban > Urban	Rural > Rural	Urban > Rural	*To rural*
Brazil	1970	18.0	50.4	25.7	6.0	*31.7*
Malaysia	1970	8.8	20.0	38.8	32.4	*71.2*
Pakistan	1973	17.2	38.7	33.0	11.1	*44.1*
Philippines	1973	39.0	25.3	19.9	15.8	*35.7*
Korea, Rep. of	1975	43.5	28.7	14.0	13.8	*27.8*
Egypt	1976	26.0	55.2	12.0	6.8	*18.8*
Thailand	1980	15.4	18.5	55.9	10.1	*66.0*
India	1981	16.7	11.9	65.4	6.1	*71.5*
Ecuador	1982	16.0	46.0	18.0	21.0	*39.0*
Honduras	1983	25.9	31.7	28.6	14.1	*42.7*
Botswana	1985	60.0	8.0	29.0	3.0	*32.0*
Ivory Coast	1986	14.8	44.2	20.3	20.7	*41.0*
Peru	1986	11.6	51.6	13.6	23.2	*36.8*
Ghana [a]	2000	10.0	23.0	32.0	35.0	*67.0*
Nepal [b]	2000	25.5	2.8	68.2	3.5	*71.7*
India [c]	2001	21.1	14.7	54.7	9.5	*64.2*

Source: adapted from Bilsborrow (1992)
[a] Mitra and Murayama (2008) ; [b] Deshinkgar and Grimm (2004); [c] Bal Kumar (2003)

Table 2.1 – Distribution of migrants by type of migration flow

It appears that among the fifteen countries listed above, the *rural to rural* migration are or has been the most important pattern in four countries (Malaysia, Thailand, India and Nepal) and exceed the *rural to urban* pattern (the famous *rural exodus* phenomenon) in eleven countries (Brazil, Malaysia, Pakistan, Thailand, India, Ecuador, Honduras, Ivory Coast, Peru, Ghana and Nepal). One can conclude in the light of these figures that *migration towards rural areas is not a negligible phenomenon*.

The magnitude of rural-oriented migration may be understood in particular through the general decrease of urban population growth trend observed around the world. Table 2.2 gives the observed (1975-2000 period) and expected (2000-2025 period) evolution of the average annual rate of change in urban population by region.

This trend – a logistic evolution of the urban population – can be explained on the first hand by a relative saturation of world metropolis and big cities and, on the other hand by the attenuation of their attractiveness on rural population (early suggested by Annable (1972)[10]).

[10] The attenuation of the urban attractiveness is subject to controversy. According to Deshingkar and Grimm (2004) the expanding urban informal sector represents a significant pull.

Average Annual Rate of Change in Urban Population (per cent)		
Region	*1975-2000*	*2000-2025**
Africa	4.1	3.1
Asia	3.5	2.3
Europe	0.7	0.1
Latin America and the Caribbean	2.8	1.5
North America	1.3	1.2
Oceania	1.4	1.2
World	2.5	1.9
More developed regions	0.9	0.5
Less developed regions	3.5	2.4

Source: UN Population Division
* projected values

Table 2.2 – Evolution of Urban population by region

Box 1 – The importance and neglect of rural-rural migration

Literature as well as data about rural-rural migration in developing countries is frugal. This is especially true when this involves intra-regional movements. However this phenomenon is not negligible: "where analysis proves possible, the rate of rural-rural migration typically proves far higher than of rural-urban migration" (Lucas, 1997, p.728). In 1985, Brown and Lawson warned about the neglect of rural-to-rural migration by the scientific community: "regrettably (…) research has remained preoccupied with rural-to-urban migrations, and the modicum of work on rural-destined or rural-to-rural movements tends to be idiosyncratic in approach, treating each case as more or less unique and rarely generalizing" (Brown and Lawson, 1985, p.415). Today, the neglect is smaller but still significant. Why does rural-rural migration remain relatively neglected in theoretical modeling, empirical analysis and in policy discussion? Of course, first, there is a crucial lack of data… being in itself a reflection of lack of attention. Second, the urban sprawl has an important visibility and urban population growth became early a key-issue in scientific studies. Third, the early dualistic development models envisioned a rather homogeneous rural sector, within which migration was seen to confer no real benefit (Lucas, 1997). The study of urban-oriented migration revealed early that this phenomenon was intimately linked to rural migrations (particularly as urban growth is partly explained by rural-to-urban migration). As it is established today that intra-rural migration may have many benefits (income opportunities enhancing, transition to wage labor, etc.) (Ahluwalia, 1976; Kikuchi and Hayami, 1983; Rosenzweig and Stark, 1989; Harteveld, 2004), the neglect should be less.

b. Circular migration

Circular migrations (also known as *seasonal*) are becoming increasingly a real option for many households, mainly in rural areas (de Haan, 1999). This strategy is often a palliative way face to the intrinsic disadvantages of seasonality especially for *ultra-poors* (Gill, 1991). Rural livelihoods are far more multi-locational than is often assumed with many rural people spending a part of the year outside the village working in non-farm occupations (Deshingkar, 2006). Contrary to early theory, *circular migration is emerging as the migration pattern of the poor* (Deshingkar, 2006).

2.1.2 Determinants of internal migration in the South

The driving factors to migrate are many. Loi (2005, p.115) summarizes the main motivations of migration: "migration in general (...) is the process of rebalancing economic resources (human and physical ones) in order to set up a new stage of economic development". Beyond this macro-economic view of migration, the motivations at individual level are more substantial: the choice to migrate depends on attractive and repulsive factors (at community and individual/household levels).

a. Pull factors

There are a lot of attractive factors (or pull factors) and it would be impossible to make the list exhaustive. These factors are the opportunities offered by the host region (Stouffer, 1940): employment (Bogue *et al.*, 1957 *in* Orlina and Recio, 1978), human capital, natural capital, surface of arable areas per head[11], high level of living at destination (Goodrich *et al.*, 1936; Toya *et al.*, 2004), security, accessibility (Ravenstein, 1889; Lucas, 1997), education and services, presence of relatives (Pernia, 1977; de Haan and Yaqub, 2008[12]), etc. As an example, an individual living in a rural area could migrate to the city to find a job. Similarly, a farmer could come in a region offering fertile land available. It is especially true in *frontier area* where *frontier migrants* move to resettlement area in search of land (Shrestha, 1989).

Specific attractive factors to rural areas may be mentioned. Indeed, the arrival on the market of more resistant transgenic plants, fertilizers and performing pesticides, the development of new irrigation systems to ensure better productivity, the

[11] The surface of arable areas per head can be, depending the case, an attractive factor (high potential of arable lands) or repulsive (low potential) (Pernia, 1977).
[12] Migrants move to places where friend, family members, neighbours or other from their village have moved before.

increase of the demand for export oriented rural products (Ranga, 2006) were as many reasons to migrate to rural areas and to work in agriculture. Deshingkar and Grimm (2004) talk about *new opportunities* in agriculture. Among other favourable factors to rural areas one may also cite an efficient road network in rural areas (offering an easy access to local and urban markets), fertile lands, a low vulnerability to natural hazards, and so on. In Vietnam, Winkels and Adger (2002) observed that the first objective of migrants from rural areas is to access to natural resources to achieve a greater economic security. The procedures and arrangements for access to land remains the fundamental issue of the installation of migrants in host areas (di Balme, 2006). As the World Development Report stated:

> "Because they lack resources and technology, land-hungry farmers resort to...moving into tropical forest areas where crop yields on cleared fields usually drop sharply after just a few years (World Bank, 1992, p.7)."

This statement reminds us that a close link between migration and environment exist. This also initiates that in-migrants driven by pull factors may have significant environmental impacts[13].

b. Push factors

As their name suggests, push factors are factors that force someone to emigrate. In the case of migration from cities, the reasons may include: population growth, growth of unemployment, the proliferation of slums and squatters, inadequate employment opportunities in the secondary and tertiary sectors, etc. In the same way, migration from rural areas can be explained by an important speculation (leading to a limited access to land), a limited access to credit, a decreasing fertility of land, etc.

Poor environmental or political conditions may also constitute push factors (Hammer, 2004), forcing people to flee ("refugees"). Such push factors are increasing for last decades in many parts of the world[14].

[13] Such impacts are discussed in Chapter 6.

[14] In the current "climate change context", besides the classical political and economical migrants, the so-called *environmental migrants* would also constitute another big challenge for next millennium.

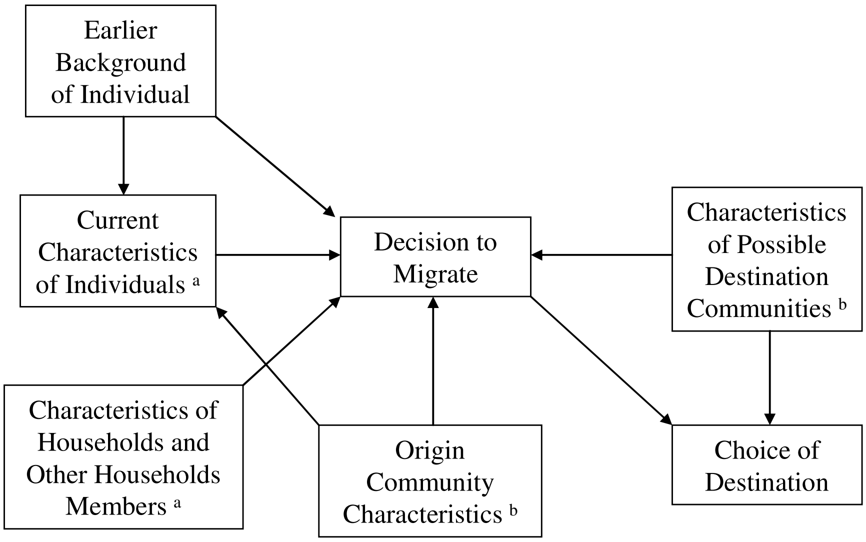
In addition to the classical pull and push factors, one had to mention also the three following elements as driving factors:

1. *Spatial inequalities* motivate migration (Todaro, 1976; Cruz, 1986; Eastwood and Lipton, 2000). The migration processes translate an imbalance situation. The local economical context not satisfying the household, other regions (potential destination zones) seem to be better to satisfy their welfare (Cruz, 1986). While many studies have analyzed such inequalities in terms of a utility – the choice to migrate being driven by an increase of utility – (Zohry, 2002; Faust *et al.*, 2003) other kind of inequality may lead inevitably to migration (poverty risk, health or education).

2. *The distance between origin and destination* may be a key determinant (Zipf, 1949; Lewis, 1982; Bilsborrow, 1984). Indeed, distance may be considered a fundamental explanatory variable which proxies the migration costs (Etzo, 2008).

3. The *size of the population* and its density can have an influence on the individual choices to migrate (Orlina and Recio, 1978). Indeed, a migrant will be able to choose to settle in an area with weak population/density (in order to avoid competition) or to settle in an area with large population/density (in order to profit, for example, of a vast market or existing cooperatives).

Of course, the final choice to migrate will depend on all these factors (push and pull, spatial inequalities, distance, population size) as a package. Therefore someone will migrate on his knowledge about the region of origin, about the host region and on basis of personal factors (see the work of Ravenstein (1885) and Lee (1966)). The following figure (Fig. 2.1) gives a global view of the factors driving the decision to migrate.



[a] Age, sex, education, health, employment status, occupation, work intensity, earnings, etc. of each member of household; household land and other assets, housing conditions, household size, etc.

[b] Employment opportunities, wage levels, land and tenure, kinship ties, inheritance systems, transportation and communication linkages, and access to community facilities, political/economic power structure, climatic factors, government investment programmes, etc.

Fig. 2.1 – Driving factors of migration (Bilsborrow, 1984)

2.1.3 Impacts of in-migration

The impacts of migrations have been studied extensively in the literature, more broadly in many diversified fields. Internal migration in less developed countries does not respond at all to the same logic as those observed in developed countries[15] (White and Lindstrom, 2005). In this section we review the main impacts of in-migration observed in developing countries. Before, as a brief introduction, we highlight the reader on the close link existing between migration and poverty.

[15] While this chapter is not devoted to the developed countries, we can notice here that many studies exist about the impact of in-migrants to developed economies. These are largely focused on the economic impacts (jobs, wages, etc.). However the economic and financial effects of in-migration are subject to debate. There are two extreme views. The optimistic view is that in-migrants bring valuable human capital and in this way can stimulate economic growth and job creation. In addition, expenditures generate income multiplier benefits. The other extreme contends that the human-capital benefits from in-migration are declining over time leading to deflation and labor concurrence. For more details on impacts of migration in developed countries see for instance Bauer and Zimmermann (1999), Taylor and Martin (2001), Borjas (2003), de Haan (2005) and Carter and Sutch (2006).

a) Migration and poverty

Skeldon (2002) indicates that migration and poverty are intimately linked. The author argues that migration may be the cause of poverty as well as the result of it. Similarly, poverty may be the cause or the result of migration. The impacts of migration vary widely and depend on many factors such as level of education, the seasonal nature of migration and / or its duration, the existing social structures, etc. (de Haan, 2005). Based on data from Bangladesh, China, Vietnam and the Philippines, Anh (2003) concludes that migration is a *driver of growth and an important route out of poverty* with significant positive impacts on people's livelihoods and well-being.

b) Effects of in-migration

i) Population Growth
In-migration induces a local demographic growth if the phenomenon is not accompanied by out-migration. Its effects are often multiple and varied. Debates surrounding the consequences of population growth on the pace of economic development have, since Malthus, been both vigorous and contentious. There is a general view that the rapid population growth of many developing countries makes it more difficult for these countries to achieve improvements in their standard of living (UN, 1999). Leimgruber (2004) indicates that high birth rate and a fast growing population in rural areas of the South are often *at the roots of poverty*.

ii) Employment and labor force
In-migration affects the labor force by increasing the human capital of the host region. In rural areas, there is a change in employment patterns and the emergence of non-farm jobs in rural areas and diversification of activities in small towns close to agricultural production areas (Peker, 2004). This helps to absorb the surplus of rural labor and to increase the urban demand for rural products.

iii) Social impacts
The arrival of migrants may alter the existing social structures. For instance, imbalances in the male/female ratio may have impacts on local politics (Deshingkar and Grimm, 2004) or conflicts may occur in (Doevenspeck, 2004) in particular about resource competition (Homewood *et al.*, 2004).

iv) Land structure and access to land
The arrival of migrants can change more or less strongly the land structure of the host region for instance by the emergence of genuine socio-political units (di Balme, 2006), new interactions local communities and local resources (Unruh *et al.*,

2005) or changes in the ease of access to land (Ostrom *et al.*, 1999; Homewood *et al.*, 2004).

v) Technical and agricultural intensity

In-migration – as often accompanied by an introduction of new technologies sometimes poorly adapted – can disrupt the performance of existing systems and resources and lead to the loss of human, cultural and social capital (McNally *et al.*, 2002). Faced with new rules and standards, members of the host community may have difficulties to implement their own resource management system (Ostrom *et al.*, 1999).

The arrival of migrants in rural areas may modify the intensity of agriculture. For an increasing number of farmers, numbers of farms can significantly increase and the size of farms can decrease, and so on. The links between population and intensive agriculture have been widely studied in the literature since the work of Malthus in 1798 and Boserup in 1965 (Araki, 2005; Tesfamicael, 2005). Some authors argue that agricultural intensification does not necessarily follow a population growth (Turner *et al.*, 1993). The agricultural intensification depends of endogenous demand (national) but mainly of exogenous demand (foreign) for agricultural products. In this way, intensification of agriculture will be higher in "export-oriented" rural areas.

There is also a link between technology, agricultural intensification and land availability. Already Dumond (1961) mentioned a direct link between population growth and technological change: practices of extensive agriculture are normally adhered to until population pressure becomes such that the system ceases to be viable through lack of sufficient land for rotation. The FAO report *World Agriculture: Horizon 2010* (FAO, 1995) discusses the case of Japan where in the late 19th century, land shortages caused biological innovations that have increased yields per hectare[16].

vi) Degradation of natural resources

The arrival of migrants in a region may be accompanied by environmental degradations mainly water pollution or massive deforestation (Lohrmann, 1996; Black and Sessay, 1997; McNally *et al.*, 2002; Hugo, 2008).

Cruz (1986), Kummer (1992) and Magdalena (1996) indicate that population pressure is *one of the causes* of massive deforestation. Indeed empirical studies have shown that – contrary to the commonly accepted view – population pressures

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[16] See Tesfamicael (2005) for agricultural intensification mechanisms.

could be not the major proximate cause of deforestation as driving factors might be more economical, political or cultural rather than demographic. Indeed, rapid deforestation is entirely compatible with low population densities if it is caused – for instance – by large-scale logging followed by extensive small-scale agriculture (Kummer, 1992). Links between population dynamics and environment have been largely discussed (Preston, 1996) and about tropical deforestation in particular (Carr *et al.*, 2006).

However some exceptions may be encountered and environmental improvement may be observed with a significant population growth induced by in-migration. In Kenya, in the Machakos district, population growth has resulted to a decrease of degradation and to a more sustainable agriculture (Tiffen *et al.*, 1994). Indeed population movements followed in response to a shortage of land occurred in the 1920s (internal migration occurring towards the most marginal land in the district) and agricultural intensification – started in the late 1930s – (the reduction of fallow periods, the introduction of multiple cultures, a closer integration of crop production and livestock, the increased use of organic fertilizers, etc.) was accompanied or followed by widespread adoption of soil conservation measures to rehabilitate degraded lands. The widespread adoption of these measures has been encouraged by the introduction of various – export oriented – crops, including coffee, fruit and other horticultural crops that produce higher incomes than basic food products and therefore makes the land conservation more profitable. The role of *remittances* was important here. Indeed, external migration to urban areas has resulted in remittances that have provided a part of capital for development. Finally, and this may be the most important factor of natural resource degradation, investments have been spent on improving roads and other infrastructure allowing an easy access to urban and foreign markets and to local processing facilities.
Let us mention that environmental problems mentioned above may be partly caused by *land use changes* driven by in-migration as a real strategy of survival.

c) Indirect effects on in-migration: effects of out-migration

In-migrants intrinsically leave a place where out-migration effects may occur. In this way, such effects can be considered as *indirect effects of in-migration*. For instance, outgoing migration may affect the labor force, i.e. a decrease of the human capital, in particular when many young men emigrate (Bal Kumar, 2003; Suzuki and Suzuki, 2007). Through the money that in-migrants send to their families left behind (*remittances*[17]), out-migration generates increasing incomes, can have a multiplier

[17] The *remittances* are not insignificant in the income of some households in many developing countries (Hossain *et al.*, 2002; Al-Ali, 2004). However the advantages and disadvantages of

effects on household income and reduces poverty (Taylor, 1999; Afsar *et al.*, 2000; Deshingkar and Grimm, 2004). Negative impacts can be associated to out-migration. Increasing consumption may lead to critical situations as local inflation to an increasing social duality or to social alteration (D'Angelo and Marciacq, 2002). For instance, out-migration often leaves behind insecure asset-depleted ‘‘residual’’ populations (Kothari, 2002) which mainly consists of indigenous people (particularly because the roots of these populations to their ancestral lands is very significant).

The object of the present thesis is not to focus on out-migration effects but it was important at this stage to mention that effects may occur elsewhere than in the hosting areas.

Box 2 – An important concept: agricultural involution
According to Geertz (1963) changing farming systems and the development of a country depends on the "use" of the labor force surplus from rural areas. For instance, Japan, in contrast to Indonesia, would be able to grow because its surplus in rural population has effectively been oriented towards urban industrial sector. In Indonesia on the contrary because of colonial structures and exportation to Europe of products extracted from surplus in the agricultural sector (surplus which could be invested in industrialization) there is an evolution of traditional agriculture to intensification of workforce. It is this phenomenon of "static expansion" in which the post-traditional social village system has absorbed about 30 million additional farmers from 1870 to 1940, that Geertz called “agricultural involution” (see Ellison, 2003).

remittances on local development are controversial. While positive impact of remittances have been reported in several sectors (education, health or housing) (Estudilloa *et al.*, 2001; Adams, 2005), some doubts exist about positive effects on the agricultural productivity or on the rural development (Taylor and Martin, 2001; Curran, 2002). There is a controversy about the role of remittances on intra-rural inequalities, *exacerbating* according to Ulack (1986), *standardizing* according to others (Stark *et al.*, 1986; Adams, 1994; Rodriguez, 1998).

2.1.4 Conclusions about internal migration literature

There are a large number of studies on internal migration. Most of them focus on urban migration and on socio-economic, societal or political impacts in urban areas. Many other authors have also studied the impacts on places of origin. Studies over the impacts (other than environmental impacts) of internal migration to rural areas as destination place are uncommon. This gap in the scientific literature is one of the justifications of our study.

Many studies on internal migration have been made during recent decades. Because data on such movements are rare, studies are often very local and focused on a single dimension. Many of them have long been dedicated to the urban environment to study the socio-economic, societal or political influences of migration in this context. A noticeable change has occurred yet in the study of internal migration since the late nineties: from partitioned studies, rather monodisciplinary and focused on urban setting, researchers are increasingly committed to studying the links between internal migration and environment. Indeed, because cities are becoming less welcoming for anyone wishing to settle there, because the finding is that today large cities are sick (hyper-urbanization, slum development, increasing informal sector, etc.), migration to rural areas - where the natural environment is very present - although already very consistent, enlarge further.

Moreover, in the nineties the World realizes – both the research community and the political or economic spheres - the importance of natural resources. The Kyoto Protocol (1998) is the symbol of this expanded awareness. It is therefore quite natural that more and more studies examining the relationship between *population and environment* were developed during last ten years (see for instance Panayotou (2000) and de Sherbinin *et al.* (2007) for a quite complete state-of-the-art of *population and environment* studies). Let us notice that initially many studies were essentially focused on the impact of migration on the environment while studies on people themselves have remained relatively rare. Today studies on the *impacts of in-migration in rural areas* (other than impacts on surrounding environment) are rather uncommon. This "scientific gap" is one of the reasons for our study.

2.2 Marginality and Poverty

If one looks at migrations and their impacts (many and varied), a geographical approach requires that we have anthropocentric questions: what are the impacts of migration on people and especially on the standards of living? Poverty has long been used to assess the welfare of people, a multitude of indicators, as well as indices, have been developed in this aim. In the first part of this section we review the main poverty indices. Because social and political isolation and spatial isolation influence much the poverty level, we specify in the second part of this section what *marginality* means and how this concept is different from the poverty one. Finally, we give some arguments which will lead us to prefer using a *marginality index* for the present study rather than the conventional indices of poverty.

2.2.1 Measurements of poverty

It is (perhaps) easy to have a picture of what poverty is. The concept of poverty refers to the idea of certain deficiencies in goods and services, which in a given society are considered vital to all its members (Petit, 2006). Poverty is defined according to standards. It is not possible to abstractly establish, i.e. outside historical, cultural and spatial conditions, poverty level indicators, because these indicators must be contextualized (Petit, 2006). The author cites the anthropologist Marshall Sahlins:

> "The people most primitive of the world had few assets but it was not poor. Poverty is not the scarcity of certain assets, or a relationship between means and ends, it is primarily a relationship between people. Poverty is a social state. And as such, it is an invention of civilization (Sahlins, 1977, p.52)" (Petit, 2006, p.1).

Numerous studies on poverty showed the multidimensional nature of poverty. The simple observation of the existing indicators that we do in this chapter reflects its complex nature.

2.2.1.1 Background

Many authors have attempted to report inequality in terms of poverty between countries or regions. Already Eden, in 1797, in his treatise *The State of the Poor*, reported the poverty in the United Kingdom since the Norman Conquest. During the nineteenth century several authors studied the human condition in "poor" populations (including Engels in 1892 and Engel in 1895). Nevertheless, it would be Rowntree who, in a study in York (UK) in 1901, would be the first to develop an *indicator of poverty*. This indicator was based on nutrition and other requirements at household level. During the first half of the twentieth century, studies on poverty do not exist as such. There are essentially descriptive studies, sometimes making spatial comparison, which analyze the living conditions of human groups (Homans, 1959). Some authors have nevertheless written major works on the subject. Bowley and Burnett-Hurst (1915) did study the influence of poverty on five urban centers in England. A few years later, Bowley and Hogg wrote *Has Poverty Diminished?* (1925). Bowley was one of the first to introduce the concept of *poverty threshold* (poverty line) (see Atkinson, 1987). Other authors at the time studied income inequality in Western society and, in a sense, a *relative poverty* (Dalton, 1920). Since the sixties, studies on poverty and human development took a clearly monetarist position. The indicators were the Gross National Product (GNP) at the national level or the total income and the GNP per capita at the level of the individual. During the seventies there was a noticeable change in the approach to poverty. The *multidimensional aspect of poverty began to emerge*. Following the work of the ILO (International Labour Organization) in the mid-seventies, it started to talk about basic needs, to define poverty not only as a lack of income but also as a lack of access to health, to education and to other services (ODI, 1999). Sen (1979) even considers that the well-being is created, not by the goods as such, but by the activity for which they are acquired and introduced the concept of *capability*. Poverty is defined as a lack in some basic capabilities. The eighties were a continuation of the previous decade. Non-monetary and demographic dimensions (power, gender, social capital, etc.) are introduced in the studies on poverty. The nineties were marked by the development of welfare approaches that sees poverty as a lack of access to welfare. During these years UNDP has also developed, inspired by the Sen's work, the concept of "human development" and "development indicators".

2.2.1.2 Poverty and human development indicators

Hereafter we present the main indices of poverty and human development used in the literature. We do not discuss the inadequacy of Gross Domestic Product (GDP) as an index of poverty. Critics of this index have already been extensively discussed in the literature. This index does not include all the components that contribute to the quality of life (INSEE, 2007).

The poverty line (or poverty threshold) is the minimum level of income considered as necessary to achieve an adequate standard of living in a given country. This threshold was first used by the World Bank in 1990. This concept has been widely discussed (see Strenghmann-Kuhn, 2000; Bourguignon and Chakravarty, 2003). There are several ways of computing poverty (WBI, 2005; Vecchi (2008) about poverty lines). As among the main ones:

1) *One dollar a day* was long regarded as the universal threshold of poverty. This value was set by the World Bank in 1990 to measure absolute poverty in the poorest countries. This value was frequently revised upwards. Recently Ravallion *et al.* (2008) suggested a value of $ 1.25 a day. There are also different thresholds in each region. In 2008, the Asian Development Bank has set the poverty line at $ 1.35 / day in Asia and Pacific. A critic to this index is that having an income slightly above the threshold is not substantially different than having an income slightly below this threshold. Indeed, the negative effects of poverty tend to be continuous rather than discrete. Low income affects different people in different ways.

2) The *headcount index* (P_0) is defined by the following formula:

$$P_0 = \frac{N_p}{N} \tag{2.1}$$

where N_p is the total number of poor (people below the poverty line) and N N is the total population. The index has been rewritten as follows (WBI, 2005):

$$P_0 = \frac{1}{N}\sum_{i=1}^{N} I(y_i < z) \tag{2.2}$$

where *I(.)* is a function that takes the value 1 if the condition in brackets is verified and 0 otherwise. For example, if the expenditure (y_i) is below the threshold z, then the household is considered as poor. The advantage of the headcount index is that it is easy to calculate and to understand. However, it does not take into account the intensity of poverty and, if it is calculated at the household level, it does not reflect the total number of poor individuals.

3) The *poverty gap index* attempts to capture the extent to which individuals are below the poverty line. The poverty gap (G_i) is defined as the poverty line (z) minus the real income (y_i) for poor people; the poverty gap is considered invalid in other cases. Using the *I(.)* described above, we have:

$$G_i = (z - y_i).I(y_i < z) \tag{2.3}$$

and the poverty gap index (P_1) may be formulated as follows:

$$P_1 = \frac{1}{N}\sum_{i=1}^{N}\frac{G_i}{z} \qquad (2.4)$$

where P_1 may be the same for two countries (or any other space entities), while the number of "extremely poor" is different.

4) The so-called *Foster, Greer and Thorbecke index* partly deals with that disadvantage. Their generic formulation is as follows:

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^{\alpha}, \quad \alpha \geq 0 \qquad (2.5)$$

This index reflects the intensity of poverty and the fact that a missing dollar is as more important than the household is poor. P_α is easily generalized to measure poverty by groups, or yi-p represents the *income gap* of a member of a group *i*, and ni is the number of poor in this group:

$$P_\alpha = \Sigma_{yi<p}\,[\Sigma_{i=1\,..\,ni}\,[(yi\text{-}p)/p)]^{\alpha}]\,/\,n,$$

which allows to aggregate measures of poverty among different groups (rural-urban, by province or region, ...). This measurement is consistent in subgroup: one can calculate this measure in different groups, aggregate them at a higher level and obtain the corresponding measure at this level. Conversely, one can also use it to calculate by how much poverty would decrease in a community, if poverty disappears in either constituting sub-group. One can well estimate the contribution of each group to the total poverty, weighted by the size of each group[18] (Baland *et al.*, 2007).

5) A multitude of other indices have been developed, each bringing an extra dimension and gradually deviating from the simplicity of the first indicators (such as the headcount index). Among many other indices, we can cite the *Sen's indicator* (Sen, 1976) regarding the number of poor, the severity of their poverty and the distribution of poverty within the studied group or the *Sen-Shorrocks-Thon indicator* (SST) which

[18] In their original study Foster, Greer and Thorbecke (1984) show in Nairobi that while the intrinsic poverty to the group of people living for a long time in Nairobi is not very high it is the group that most contributes to global poverty because of its size.

includes the Gini coefficient. All these indices remain fundamentally focused on a monetary or structural (in the economic sense) approach of poverty. See the work of Essama-Nssah and Lambert (2006) for other indices based on poverty lines.

6) For two decades now, scientists trying to develop composite poverty indices. The *Human Development Index (*HDI) is undeniably the most famous index. The index was developed in 1990 by the UNDP. As a composite indicator, it reflects the health (measured by life expectancy at birth), education (measured by adult literacy rate and gross enrollment) and the standard of living (measured by GDP per capita in purchasing power parity). The methodology to calculate this index is presented in annex 1. However, this index hides an uneven distribution of progress and the importance of residual human poverty (Noiseux, 2005; Bagolin and Comim, 2008).

7) Under the recommendations of prestigious economists such as Anand and Sen (1994), UNDP in 1997 proposes a new composite indicator: the *Human Poverty Index* (HPI). Two indicators are developed: HPI-1 for "developing countries" and HPI-2 for other OECD countries[19]. These composite indices are based on the same principle that the human development index. Both indices measure the gaps in the following dimensions: life expectancy and quality of life, knowledge and social integration.

• HPI-1 is calculated using the following formula:

$$\text{HPI-1} = \left[\frac{\left(P_1^{\alpha} + P_2^{\alpha} + P_3^{\alpha} \right)}{3} \right]^{1/\alpha} \tag{2.6}$$

where $\alpha = 3$, P_1 is the probability at birth of not reaching 40 years, P_2 is the rate of adults illiteracy and $P_3$is the unweighted average of (a) the proportion of people lacking sustainable access to water and (b) the percentage of children who lack weight.

• HPI-2 is calculated in the same way that the HPI-1 but takes into greater account of social isolation. The formula to calculate the HPI-2 is as follows:

[19] With the exception of a few: Hungary, Mexico, Poland, Republic of Korea, the Czech Republic and Turkey.

$$\text{HPI - 2} = \left[\frac{\left(P_1^{\alpha} + P_2^{\alpha} + P_3^{\alpha} + P_4^{\alpha} \right)}{4} \right]^{1/\alpha} \tag{2.7}$$

where $\alpha = 3$, P_1 is the probability at birth of not reaching age 60, P_2 is the percentage of adults with literacy deficiencies, P_3 is the percentage of the population living below the poverty threshold and P_4 is the rate of unemployment.

The higher the value for a spatial entity of these indices HPI-1 and HPI-2, the poorer this entity is.

8) Early, some critics have been formulated in particular about the identical weight given to each of the HPI's components (Bourguignon and Chakravarty, 2002; Minvielle and Bry, 2003; Bibi and El Lahga, 2006) and several composite indicators using standardized components have been proposed (see for instance Minvielle and Bry (2003) and Bourguignon and Chakravarty (2003)). These indices have a clear econometric orientation and meet the philosophy of "threshold indicators" as presented above.

2.2.2 Measurements of marginality

It is therefore evident from the various indices of poverty mentioned above that there is no ideal index. None reflects the multi-dimensionality of poverty, intra-group disparities, contextual specificities, and so on. Not convinced by the indices of poverty in their ability of capturing the social exclusion of people, we have shifted to other disciplines, more social or societal than economical, in order to see how they address and quantify the concept of poverty/marginality.

Research in anthropology or psychology, and more broadly in human sciences, often mention marginality as a cause or consequence of poverty. Marginality and marginal areas are concepts often used in the social sciences, with different interpretations and perceptions. Social scientists often do not define these concepts (Cullen and Pretes, 2000). A series of studies consider marginality as shelving, as social isolation. Some authors have explored the marginalization of women in the labor market in Sweden (Malmberg-Heimonen and Julkunen, 2002), the marginalization faced by in-migrants in urban areas (Wacquant, 1999) and others. However, both concepts are ambiguous, often confused or associated to the same reality: there are welfare disparities in all societies.

Reviewing the different definitions of *marginality* and its measurements will help in extracting features or methods not discussed yet in studies on poverty with a view of establishing our research protocol.

2.2.2.1 Marginality: definitions and typologies

The definitions of marginality are several and sometimes fuzzy. According to Larousse Encyclopedia (2008), 'marginality' refers to a marginal position in relation to a social norm or social standards. For the International Geographical Union (IGU) the marginality is defined as the (temporary) state of isolation at the fringe of a given system (Gurung and Kollmair, 2005). According to Andreoli (1992, p.24) a marginal region is defined as a region "located at the margin of a system as regards its socio-economics features". Sommers *et al.* (1999) define the *socio-economic marginalization* as a socio-spatial context conducting a territorial entity to an economic, political and social under-performance in comparison to the entire territory. It appears that the concept of marginality refers to oppositions ('standards', 'fringe', 'under-performance') within a system and that the space ('isolation') plays a key role in such oppositions.

Two major conceptual frameworks, i.e. societal and spatial, help to describe marginality. Therefore, Gurung and Kollmair (2005) distinguish *societal marginality* (low social conditions) of *spatial marginality* (isolation from the economic centers). Driving factors of such marginalities have been reported in the literature (Table 2.3) (Metha, 1995; Sommers *et al.*, 1999; Brodwin, 2001; Larsen, 2002a; Larsen, 2002b).

> The social marginality reflects the underlying social conditions of individuals. These conditions include limited livelihood means (lack of resources, skills and opportunities), a reduced or restricted participation in decision-making, a declining sense of community and a low self-esteem. Marginalized people are often victims of discrimination, stigma, often ignored and punished on the basis of race, sex, age, culture, religion, ethnic origin, type of employment or further education (Brodwin, 2001; Larsen, 2002a; Larsen, 2002b; Subirats *et al.*, 2004). These "*disadvantaged people* struggle to gain access to resources, and full participation in social life" (Gurung and Kollmair, 2005, p. 10).

The spatial dimension of marginality is usually related to the geographical remoteness of an area to the major economic centers, and refers to areas that are difficult to reach due to the absence of an adequate infrastructure, being that much isolated from developed areas. Therefore, the marginal space indicates the relative distance to economic centers. And it is true that rural areas are very often marginal but marginal areas exist in cities as well (Leimburger, 2004).

Societal marginality	Spatial marginality
• lack of resources, skills and opportunities, • reduced or restricted participation in public decision-making, • less use of public space, • lower sense of community • low self-esteem • labor segmentation • corruption • religious fundamentalism • discrimination (race, gender, age, culture, religion, in-migration, ethnicity, occupation, education)	• locational and physical limitations (remoteness)

Table 2.3 – Societal and spatial marginality

Whatever marginal situations find their roots in "asymmetric relationships" with cores (Petrov, 2008, p. 16) leading often to social, economical, political and legal exclusions and, as a consequence, to a vulnerability of the *marginalized groups* (Müller-Böker *et al.*, 2004).

Besides the *societal-spatial* distinction described above, Mehretu *et al.* (2000) propose taxonomy of marginality. They distinguish four types of marginality: contingent, systemic, collateral and leverage (Fig. 2.2):

Contingent marginality is a condition that results from competitive inequality in which individuals or communities are placed at a disadvantage because of the dynamics of the free market "whose uncertain and often random outcomes adversely affect them" (Mehretu *et al.*, 2000, p.90). This type of marginality particularly affects the individuals or communities which are not prepared to successfully negotiate on the markets because of unattractive locations, cultural restrictions, inadequate labor skills and lack of useful information about opportunities. This type of marginality refers to the notion of "economic exclusion".

Systemic marginality results from disadvantages which people and communities experience in a socially constructed system of inequitable relations within a hegemonic order (class, ethnos group, age, kind). This type of marginality refers to the notion of "social exclusion".

Collateral marginality is a derivative form of disadvantage which depends on the existence of contingent and/or systematic marginality. Collateral marginality is a condition experienced by individuals or communities who are marginalized primarily on the basis of their social or geographic proximity to individuals or communities that experience either contingent or systemic marginality. This type of marginality refers to the notion of "contagion" or "spillover" and could be considered as a negative externality of contingent or systematic marginalities.

Leveraged marginality, like collateral marginality, is a derivative form of contingent or systemic disadvantage that people/communities experience when their bargaining position as wage earners and suppliers to advanced enterprises is weakened by transnational corporate agents who leverage lucrative concession by using the prevalence of alternative, often cheaper, substitutes for labor supplies or intermediate inputs in less prosperous communities to which they can potentially take their business. This type of marginality refers to the notion of "competitive exclusion".

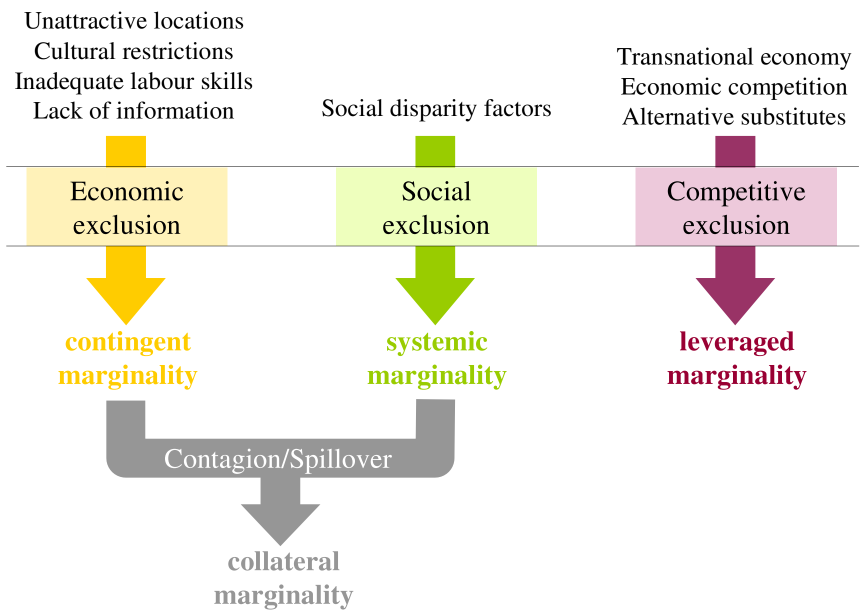


Fig. 2.2 – Four types of marginality and their driving factors
(source: author, based on Mehretu *et al.* (2000))

Mehretu *et al.* (2000) propose also two spatial patterns of marginality schematized at figure 2.3.

> "The spatial form of contingent marginality is generally described by distance-decay functions of unequal distribution of development indicators like income per capita declining over distance from the centre of growth. Distance-decay patterns may be distorted by local environmental, cultural and economic limitations that invite localized contingent marginality, but the overall pattern is indicative of a decline in development variables with distance from the centre of development" (Mehretu *et al.*, 2000, p. 96). This marginality is assumed to embrace *convergent and diffusionist dynamics of development*.

> "The spatial form of systemic marginality is more complicated. First, although distance-decay may generally apply to macro-spatial patterns in the distribution of developments indicators, the linear form of the decay in contingent marginality is not present here. The decay in systemic marginality tends to be more discontinuous with significant truncation of the function with distance from the metropolitan core to the rural periphery. It is exemplified by sharp qualitative and quantitative breaks of physical and social environments as one traverse from the centre of a typical

modern and technologically sophisticated primate city to the rural margins" (Mehretu *et al.*, 2000, p. 96) (examples: Mexico City, Nairobi). This marginality operates more within the *centre-periphery mode*.

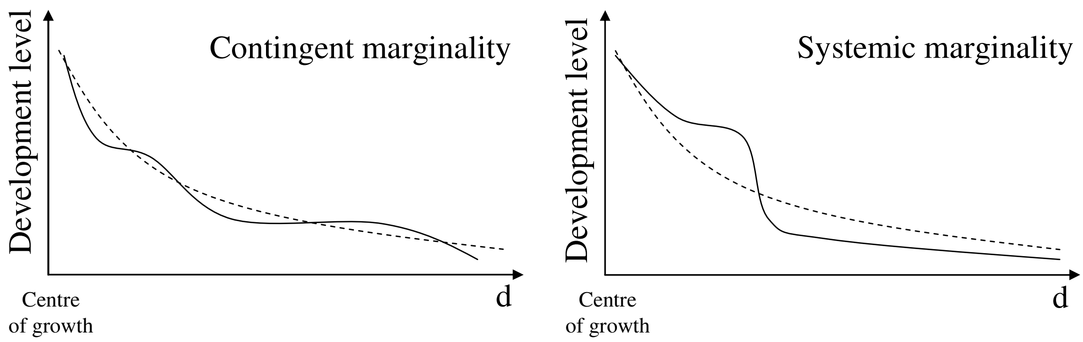


Fig. 2.3 – Schematic view of spatial patterns
for contingent and systemic marginality

As one sees, *marginality*, *vulnerability* and *exclusion* are closely entangled. More, marginality is perceived less *materialistically* than poverty. Whether social, political and/or spatial *isolations* are, in any case, key-elements in the definition of marginality.

2.2.2.2 Indicators of marginality

The following table (table 2.4) provides an overview of the main indicators of marginality (-ies) used in scientific studies.

Subject	Indicators
Societal	Child labor; gender inequalities; social exclusion, human rights violations
Infrastructure	Access to clean water; distance to transportation, bank, and communication facilities; energy supply
Health	Life expectancy; infant mortality, under- and malnutrition
Education	Literacy rate; gross enrolment ratio
Political	Participation in elections; corruption index; security status (violence, crime)
Economic	GDP per capita; unemployment rate
Environmental	Environmental pollution; conditions of natural resources
Development Index (existing)	Human Development Index (HDI); Gender Related Development Index (GDI); Human Poverty Index (HPI)

Table 2.4 – Indicators of marginalities (Gurung and Kollmair, 2005)

As Gurung and Kollmair (2005, p.17) rightly indicated "each indicator in isolation may not serve alone to provide a sharp picture of marginality, but as a package, this could help to illustrate the overall picture and help to deepen understanding". In addition, many of these indicators are not adapted to local analyses. We agree with the idea, mentioned earlier, to develop a composite index.

2.2.3 Composite indices

Whether in studies dealing with poverty or marginalization, composite indices, already mentioned above (HPI-1, HPI-2, etc.) seem to be most suitable for the study of a multidimensional reality, although they can not be interpreted without a critical analysis of geographic, political, economic and social contexts. We present below some composite indicators using the original results from a factorial correspondence analysis (FCA) or from a principal component analysis (PCA). Although different, these two methods have the same goal: summarize the information observed in several variables in a number, less, of new variables, called factors (for a formal introduction to factorial analysis, refer to Cox (2005) or Everitt and Dunn (1991)).

2.2.3.1 « PCA-methods »

According to classical PCA data processing (Sharma, 1996; Sricharoen, 2006) each factorial component (F_i) is a weighted linear combination of the original variables (indicators).

$$F_i = w_1X_1 + w_2X_2 + w_3X_3 + \ldots + w_nX_n \qquad (4)$$

where weights (w_n) are specified so that F_i takes into account the maximum variance on $X_1, X_2, \ldots, X_n$. As the first PCA component contents the highest rate of information the index of marginality (M) of a spatial entity j may be expressed as:

$$\begin{aligned} M_j &= f_1 \cdot \frac{(a_{j1} - m_1)}{s_1} + \ldots + f_n \cdot \frac{(a_{jn} - m_n)}{s_n} \\ &= \sum_{k=1}^{n} f_k \frac{(a_{jk} - m_k)}{s_k} \end{aligned} \qquad (2.9)$$

where f_k is the first component eigenvector of the k-th core-indicator, a_{jk} is the value of the core-indicator k represents the spatial entity j and m_k and s_k are respectively the mean and the standard deviation of the core-indicator *k* calculated on all the spatial entities (standardization process).

One of the key concepts of PCA-based indices of poverty is that the first axis *can be selected as a "poverty index"* (Henry *et al.*, 2003; Cavatassi *et al.*, 2004; Sricharoen, 2006) since this axis takes into account the maximum of information and its correlations with the original variables (indicators) are the strongest. This philosophy is well illustrated by Zeller *et al.* (2001) and Henry *et al.* (2003), adapted by Sricharoen (2006) (Fig. 2.4):

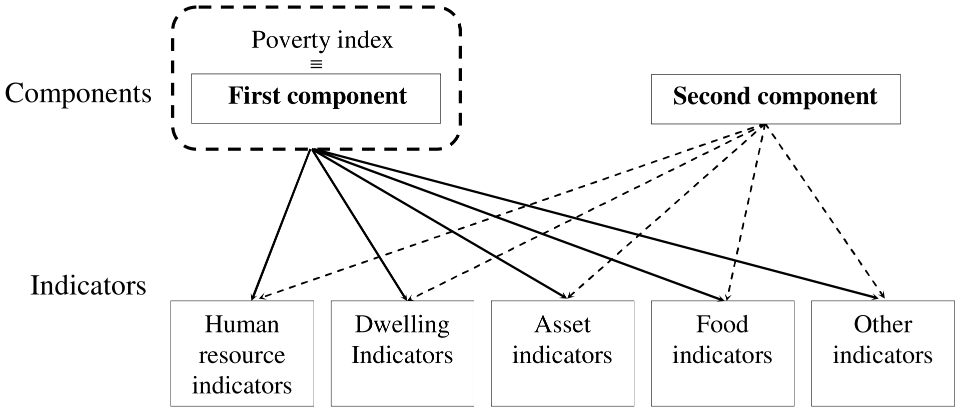


Fig. 2.4 – The PCA philosophy
The 1st component is considered as *poverty index*

Therefore, PCA may be used to calculate a set of weights that indicate the relative contribution of each indicator to the first component (Zeller *et al.*, 2001), i.e. poverty or marginalization. Then, a poverty index for each entity (household, village, etc.) can be calculated.

To give to Caesar what is Caesar's, during the nineties the Mexican government (CONAPO) was one of the firsts that developed, as part of an urban anti-poverty program (PROGRESA), an index of marginality using the results of PCA. The index was based on seven variables from Census 1990 and 1995 (CONAPO-PROGRESA, 1998). The idea of this index, already explained above, was (i) to apply PCA on the seven variables and (ii) to involve eigenvectors of the first component as weight of each variable in the index. In the PCA, the eigenvector provides the score of each variable factor, which indicates the direction and weight of the impact of each variable component (Cavatassi *et al.*, 2004). In this case, only eigenvectors on the first factor (F1), which represents the marginality, are used.

The index (which we call *Index of marginality* thereafter) for a unit of analysis *i* may be formulated as follows (after Cavatassi *et al.* (2004)):

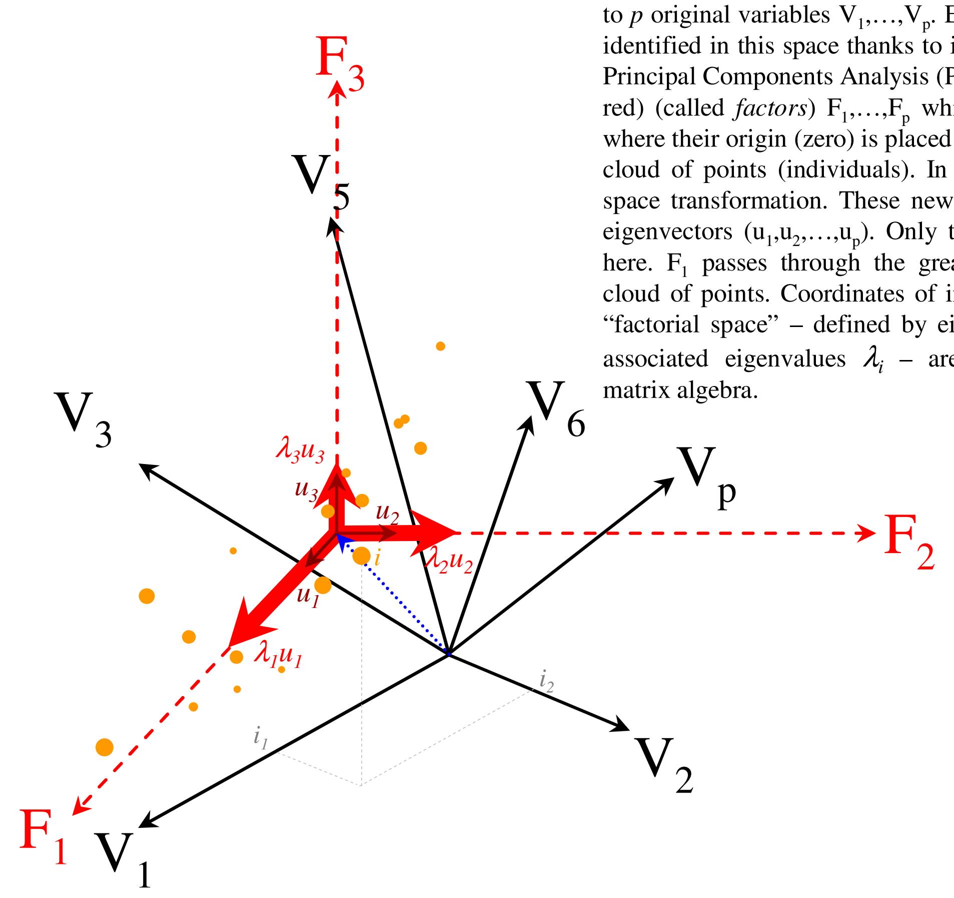
$$\begin{aligned}\text{Marginality Index}_{\ j} &= f_1 \cdot \frac{(a_{j1} - m_1)}{s_1} + \ldots + f_n \cdot \frac{(a_{jn} - m_n)}{s_n} \\ &= \sum_{k=1}^{n} f_k \frac{(a_{jk} - m_k)}{s_k}\end{aligned} \tag{2.10}$$

where f_k is the first component eigenvector of the variable k, a_{jk} is the value of spatial entity j for variable k, m_k and s_k are respectively the average and the standard deviation of the variable k for all spatial entities. In other words, the value of M for a spatial entity j corresponds to its score on first component, and the highest the value of this index is, the highest the marginality is.

This formula was adapted by Kerr *et al.* (2004) as part of a study on the effect of poverty on deforestation and by Filmer and Pritchett (1998) in a study on recruitment in the education sector in India.

PCA has also been used for the construction of other indicators in studies on poverty. Oliveau (2004) has constructed an *index of modernization* which includes an index of isolation in South India. Its methodology is to apply a principal component analysis on variables such as the population, the sex ratio in the labor force, the number of ownership among the population, the labor force employed in the primary sector (%), the rate of literacy, the fertility rate, etc.

Box 3 – Principal Components Analysis (PCA) – key elements



Let a space with *p* dimensions (in black) corresponding to *p* original variables $V_1,\ldots,V_p$. Each individual *i* can be identified in this space thanks to its coordinates $(i_1,\ldots,i_p)$. Principal Components Analysis (PCA) finds new axes (in red) (called *factors*) $F_1,\ldots,F_p$ which are orthogonal and where their origin (zero) is placed at the centre of mass of cloud of points (individuals). In other words PCA is a space transformation. These new axes are described by eigenvectors $(u_1,u_2,\ldots,u_p)$. Only three factors are drawn here. F_1 passes through the greatest elongation of the cloud of points. Coordinates of individual *i* in this new "factorial space" – defined by eigenvectors u_i and their associated eigenvalues λ_i – are calculated thanks to matrix algebra.

2.2.3.2 « Correspondence Analysis Methods »

Several authors such as Asselin (2002), Ki *et al.* (2005) and Ningaye and Ndjanyou (2006) have exploited the results of a Multiple Correspondence Analysis (MCA) to build a composite index of poverty. From statistical data coded in binary format (to obtain a matrix of contingency), the built index has the following formula:

$$CPI_j = {}^{\mathrm{MCA}}M_j = \sum_{k=1}^{n} W_k R_{kj} \qquad (2.11)$$

where W_k is the weight (normalized score) of the modality *k* on the first axis and R_{kj} is an indicator taking the binary value 1 when the spatial entity has the modality *k* and 0 otherwise.

Another formula has been proposed by Djoké *et al.* (2006):

$$CPI_j = \sum_{i=1}^{K} \frac{score_{ji}}{K\sqrt{\lambda_\alpha}} \tag{2.12}$$

where $score_{ji}$ is the score of the spatial entity j for the variable i, K is the number of categorical variables and λ_α is the first eigenvalue.

Asselin (2002) recommends MCA when it comes to analyze the pattern of relationships of several categorical dependent variables. As such, MCA is used when the variables to be analyzed are categorical (nominal) instead of quantitative. Each nominal variable comprises several levels, and each of these levels is coded as a binary variable (contingency table). MCA can also accommodate quantitative variables by recoding them as nominal observations. Studies based on MCA to generate composite poverty indices include the works of Asselin and Tuan (2005) in Vietnam, Ki *et al.* (2005) in Senegal, Ningaye and Ndjanyou (2006) and Njong and Ningaye (2008) in the case of Cameroon.

2.2.3.3 Critics of multivariate analysis of marginality

According to Leimgruber, quantitative analyses using various socio-economic variables – including for instance demographics, sectoral economy, social and cultural aspects – may result "to a statistically medium degree of marginality of the regions studied, which is meaningless because of the mingling of factors" (Leimgruber, 2004, p. 50). The author argues that "the subjective choice of variables influences the result and can lead to the statement that a region is marginal because someone (the researcher, local authorities, the private sector, etc.) wants it to be marginal" (Leimgruber, 2004, p. 50).

We are not so categorical and we believe that a composite index is a good tool to give a finely-shaded objective picture of the marginality which is "a relative phenomenon" (Andreoli, 1992, p.42). Therefore composite indices will be used further in our study (see Chapter 5).

2.2.4 Poverty, marginality and isolations

2.2.4.1 Accessibility and development: spatial isolation does matter

Most of the empirical studies that attempt to explain spatial inequality within a country find that public infrastructure – and transport infrastructure in particular – is a key explanatory factor (Christiaensen *et al.*, 2005; Kanbur and Venables, 2005). Moreover improvement of transport infrastructure may have impacts on the development in particular in rural areas (Bird *et al.*, 2007). Accessible areas offer numerous opportunities for development: opportunities for agricultural production, a better access to development assistance projects, a better market integration, an ease ability of individuals to participate in development and in social activities, and so on (Omamo, 1998; Odoki *et al.*, 2001; van de Walle, 2002; de Haan and Dubey, 2003; Nagendra *et al.*, 2003). This is especially true in mountainous areas. With the opening of new roads in mountainous areas, village communities have access to markets, health care and schools (van de Walle, 2002). The close link between high levels of remoteness and high incidence of chronic poverty appears here obvious (Bird and Shepherd, 2003). Such *remoteness-poverty* links are for long identified in particular through participative approach (Okidi and Kempaka, 2001; ADB, 2002).

Nevertheless improvement in the road network is not necessarily accompanied by a local development because many other development factors exist (availability of natural resources, types of governing institutions, etc.) (Castella *et al.*, 2005). In the same way, while Jacoby (2000) states in an empirical study in Nepal that transport infrastructure plays a central role in rural development, it also mentions that the profits generated by these infrastructures are not enough important or effectively targeted to reduce significantly income inequalities among the population.

Motorized transport efficiency and transport services offer may also explain remoteness. Motorized transport are often extremely slow on rural roads and most transport services are urban or inter-urban (Dawson and Barwell, 1993; Sieber, 1998; Starkey, 2001). This leads most rural marginalized groups to use alternative transportation means (intermediate means of transport or IMTs[20]) which have great

[20] In rural areas people use a variety of means of transport to access essential economic and social services and transport goods. These range from the most basic - walking and carrying goods on one's person back or head- to relatively large-scale motorised transport. Between these two extremes, there is a wide variety of Intermediate Means of Transport (IMTs) that can increase transport capacity and reduce human drudgery without the high costs associated with large motor vehicles. Options include

potential to reduce poverty by reducing geographic isolation and the harshness of transport activities.

2.2.4.2 Accessibility and marginality

We have just seen that accessibility, and in particular transport infrastructure, plays a significant role in regional development. Remoteness can also influence considerably the marginality at other levels, either at the individual, household or community (de Haan and Lipton, 1998; Bird *et al.*, 2002). Disadvantages of remoteness may lead to situations of low asset holdings: low quality 'human' assets (uneducated and in poor health); few natural assets (no land and limited access to common property resources); few physical assets (poor quality housing, limited tools); minimal financial assets (no savings accounts and no access to formal credit); limited 'social capital' (a network of kin and neighbours with few assets and highly vulnerable to risk); and, few 'political capital' - the capacity to 'voice' needs and preferences and influence decisions in social and political arenas (Bird *et al.*, 2007).

Box 4 – The concept of "spatial poverty trap"

The individual or household characteristics have often been used as explanatory factors of poverty (see various examples in Ravallion (1996)). More recently, geographical factors appear to play a significant role in precarious situations. Ravallion (1996) refer to *spatial poverty traps* defined as places where the geographical capital (natural, physical, political, social and human) is low and, partly consequently, poverty is important. Since then, this concept has been widely used and studied (Jalan and Ravallion, 1997; Daimon, 2001; World Bank, 2000; CPRC, 2004; Bird *et al.*, 2007). Basically there are four types of such traps (CPRC, 2004): (i) remote regions and areas experiencing frictional distance and locational disavantages, (ii) low potential areas (regions with low natural capital), (iii) less favoured areas (politically disadvantaged) and (iv) weakly integrated regions (few links and economic disadvantages).

single- and two-wheel technologies, tricycles, waterway technologies (low-cost boats), etc. powered by an engine or animal-powered (IFRTD, 2008).

2.2.4.3 Social and political isolations do matter

As illustrated above, spatial isolation does matter. But social and political isolations do matter too. As mentioned by Sen (2000, p. 5) "being excluded from social relations can lead to (…) deprivations as well, thereby further limiting our living opportunities".

Social exclusion can be distinguished from social isolation, defining social isolation as the phenomenon of non-participation (of an individual or group) in a society's mainstream institutions, while reserving 'social exclusion' for the subset of cases in which social isolation occurs for reasons that are beyond the control of those subject to it (Barry, 1998). Political isolation (voluntary or not) is a particular type of social isolation processes, where non-participation to society life is due to lack of integration into the political sphere. We will see forward that such phenomena are common in the Philippines especially in Agusan del Sur.

2.2.5 Indigenous People and marginality

In section 2.1, we have discussed the positive and negative effects of migration as reported in the literature. As we focused on the relationship between migrants and marginality, we similarly suggest investigating indigenous people (IPs) (for a formal definition of IPs see box 7).

Socio-economical dissimilarities between IPs and non-IPs may exist. For instance, differences in the access to resources or facilities – e.g. health care – have been reported (Stephens *et al.*, 2005). Income differences have been also observed driven sometimes by opposite strengths. On the one hand indigenous people income would be less affected by macroeconomic trends but on the other hand being indigenous would increase the likelihood of becoming poor (Hall and Patrinos, 2005). Socio-economic conditions commonly observed in indigenous populations (lower education quality, low labor market returns, etc.) might explain a significant proportion of the earnings gap between indigenous and non-indigenous people.

Anyway, the marginal status of indigenous people depends of the point of view. For example, in a study in Bolivia, while the Chusquisaca, a region with very high proportion of IPs, is measured – by income – as the second poorest region of the country, its residents rated themselves "the least poor" in the country (Perry *et al.*, 2006). "Geographical and cultural attractions may offset income poverty and prevent further arbitraging of spatial earnings differentials" Perry *et al.* (2006, p. 138) quote.

2.4 General conclusion about internal migration and poverty/marginality literature

Internal migration is a strategy of survival, and among the different types of internal migration, the rural-rural migration remained significant. The driving factors are manifold. For instance, one will migrate to find better living conditions often around the city - in the hope of finding work (formal or informal) in the secondary or tertiary sector - or even to rural areas where the potential agro-ecological capital remains significant. The impacts of migration are various and depend, as we have seen, on many economic, social and/or political factors. Among the most significant impacts, we notice the possibility of changes in land use, in agricultural intensity or in the local social structure. However, few studies have been devoted to the impact of internal migration as a rural destination.

The measurement of poverty is complex and many poverty indices developed in the literature, although composite remain very econometric. Most often, social and political isolations, as well as remoteness, influence (or bias) values of classical socio-economical indicators are used to assess poverty (Fig. 2.5). For instance, if the access to drinking water (a poverty indicator classically used) is low in a given village, it might be due to social/political isolation or remoteness from economical centers[21]. We assume that the marginality concept is more appropriate to capture socio-economical, political and geographical disparities. Like Gurung and Kollmair (2005, p.18) we argue that marginality is an important "crosscutting concept" in examining "the rationale behind spatial, economic and social disparities among and between regions/countries and individuals/communities in the light of legitimacy, equity and social justice".

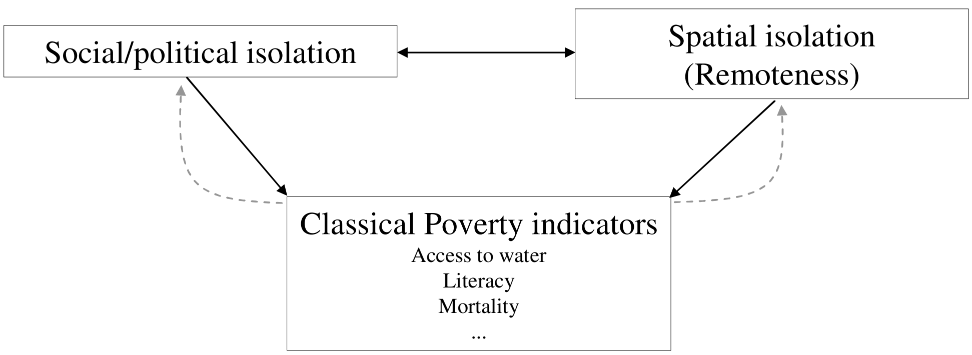


Fig. 2.5 – Interactions between *poverty* and isolations

[21] This leads us hereafter to use *marginality* and as a second step to "subtract" the influence of spatial isolations (see *endogenous marginality concept*, chapter 5)

Even it is difficult to generate a concise definition, incorporating all the dimensions of marginality, the concept of marginality is therefore introduced because it captures more the multidimensional aspect (Fig. 2.6) of precarious situations. We propose the following conceptual formula:

$$\text{Marginality} = \text{Poverty} + \text{Spatial isolation} + \text{Social and Political isolation} \tag{2.14}$$

This equation clearly shows that marginality is much *more than poverty* and the fact that being marginal means a *choice deficit* by the *relative unfavourable* spatial, social and political isolations.

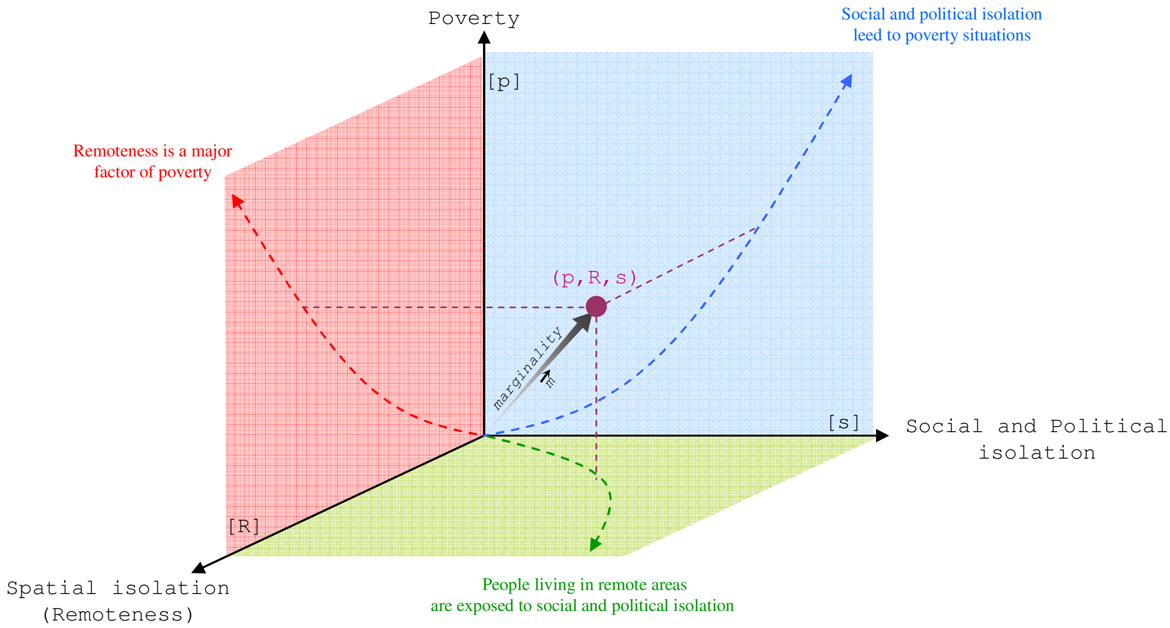


Fig. 2.6 – The concept of marginality and its multidimensionality

In the conceptual figure above, each unit can be located in the 3D-space through its coordinates (p,R,s) and marginality is considered as the following vector – as a combination of the 3 dimensions: poverty, remoteness and social and political isolation:

$$\vec{m} = \begin{pmatrix} p \\ R \\ s \end{pmatrix} \tag{2.15}$$

Chapter 3

Study area rationale

In the South, many countries are experiencing substantial population growth and this, combined with specific contexts (political, social, economic or environmental), often leads to an *unstructured social landscape*. Migration is often a selective strategy for survival with significant impacts at multiple levels (demographic, economic, environmental, political, etc.) as we notice in the previous chapter.

The province of Agusan del Sur, Northern Mindanao, Southern Philippines (Fig. 3.1), known for many decades in-migration waves mainly from rural to rural, the pressure on land is high and the observed level of poverty is very wide despite an undeniable human and environmental capital. *This geographical context justifies the location of the studied site.* The study of the latter would permit to fill the scientific gap already mentioned in the first chapter.

In this chapter, we briefly present the administrative structure in the Philippines, the poverty situation of the province within the country as well as some provincial 'geographic generalities'. Then we discuss broadly the historical, socio-economic and demographic contexts to finally present the main concerns encountered by the provincial population.

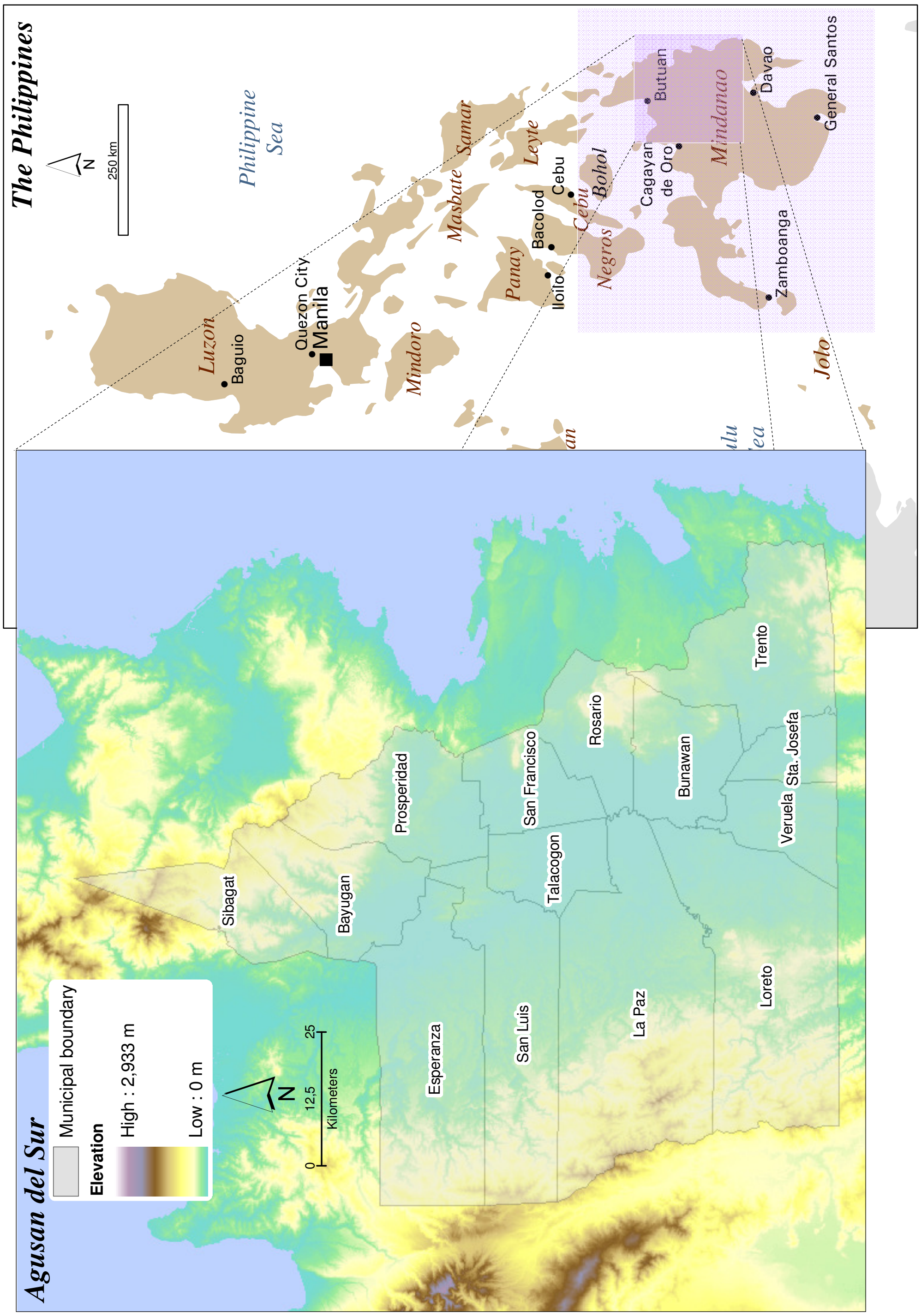


Fig. 3.1 – Agusan del Sur, Mindanao, Southern Philippines

3.1 Generalities

3.1.1 Administrative structure within the Philippines

Before describing the study area we give some useful information about the administrative structure in the Philippines.

The Philippines is divided into, from the highest division to the lowest (Fig. 3.2):

1. Regions[22]
2. Provinces and independent cities
3. Municipalities and component cities
4. Barangays (native Filipino term for a village)

Each division at each level from the provinces down to the barangays is a local government unit (LGU). There are 18 administrative *regions*, 79 *provinces*, 1,425 *municipalities*, 115 *cities* and about 43,000 *barangays*. Each barangay contains several *puroks* (zones) and/or *sitios* (territorial enclave inside a barangay especially in rural areas).

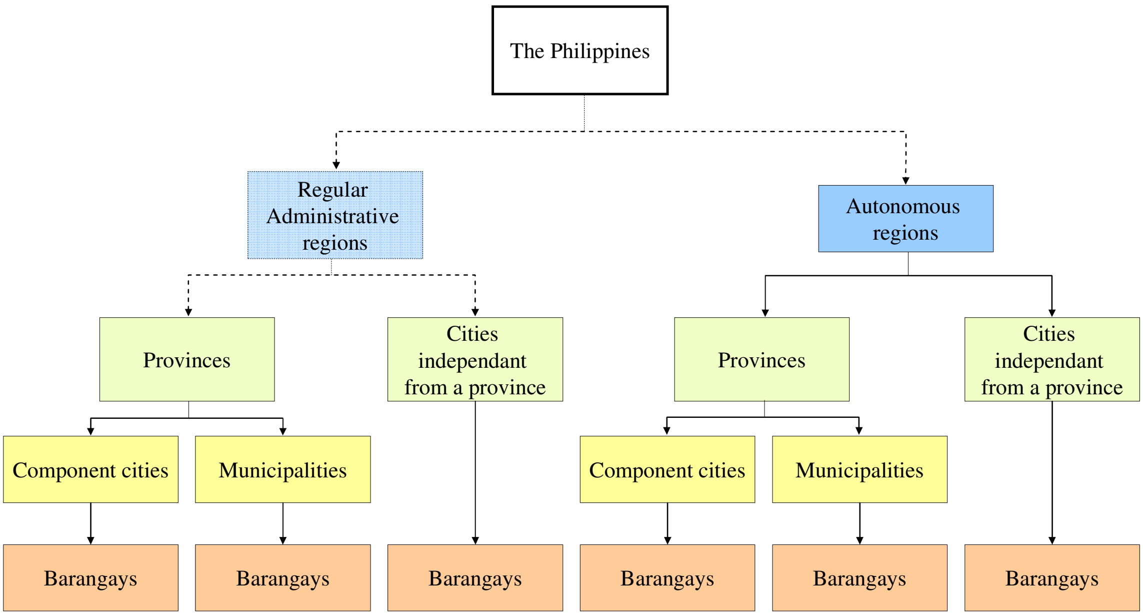


Fig. 3.2 – Administrative structure in the Philippines

[22] Formally one distinguishes *autonomous regions* and *regular administrative regions*, these latter having no political power.

3.1.2 Agusan del Sur Province

Agusan del Sur Province (ADS), about 9000 square kilometers, located in the Caraga region (Region XIII) in the North-West part of Mindanao (Fig. 3.3), the Philippines, has been selected as study area due to its important poverty level. Poverty incidence at municipal level – i.e. the proportion of families with per capita incomes below the municipal poverty threshold[23] – in 2003 throughout the Philippines is mapped below (Fig. 3.4). The reasons why Agusan del Sur is so poor are various but an admitted one is the lack of infrastructure and a poor accessibility to market. Agusan del Sur is an elongated basin formation with a central longitudinal valley surrounded by eastern and western mountain ranges. The Agusan River runs almost northward in the middle of the valley. Agusan Marsh, one of the most ecologically significant wetlands in the Philippines, occupies the central area of the basin. Forestland constitutes about 75% of the total land area while the alienable and disposable (A&D) constitutes 25%. Climate has no dry season with very pronounced wet season of heavy precipitation. Maximum rainfall generally occurs from December to January. The population of ADS was 609 thousands in 2007 with a density of 67 persons per sq km. 27 % of the population lives in urban areas. The province is composed of 13 municipalities (Fig. 3.5) (Bunawan, Esperanza, La Paz, Loreto, Prosperidad, Rosario, San Francisco, San Luis, Santa Josefa, Sibagat, Talacogon, Trento and Veruela) and 283 villages (locally called *barangays*). The three main towns of the province are Bayugan, Prosperidad (administrative capital) and San Francisco. About 170,000 has (20% of the total provincial area) are used for agriculture, permanent or temporary crops. Other activities are commercial logging and plantations.

[23] Remain that the *poverty threshold*, introduced in section 2.2.1.1, is the minimum level of income deemed necessary to achieve an adequate standard of living.

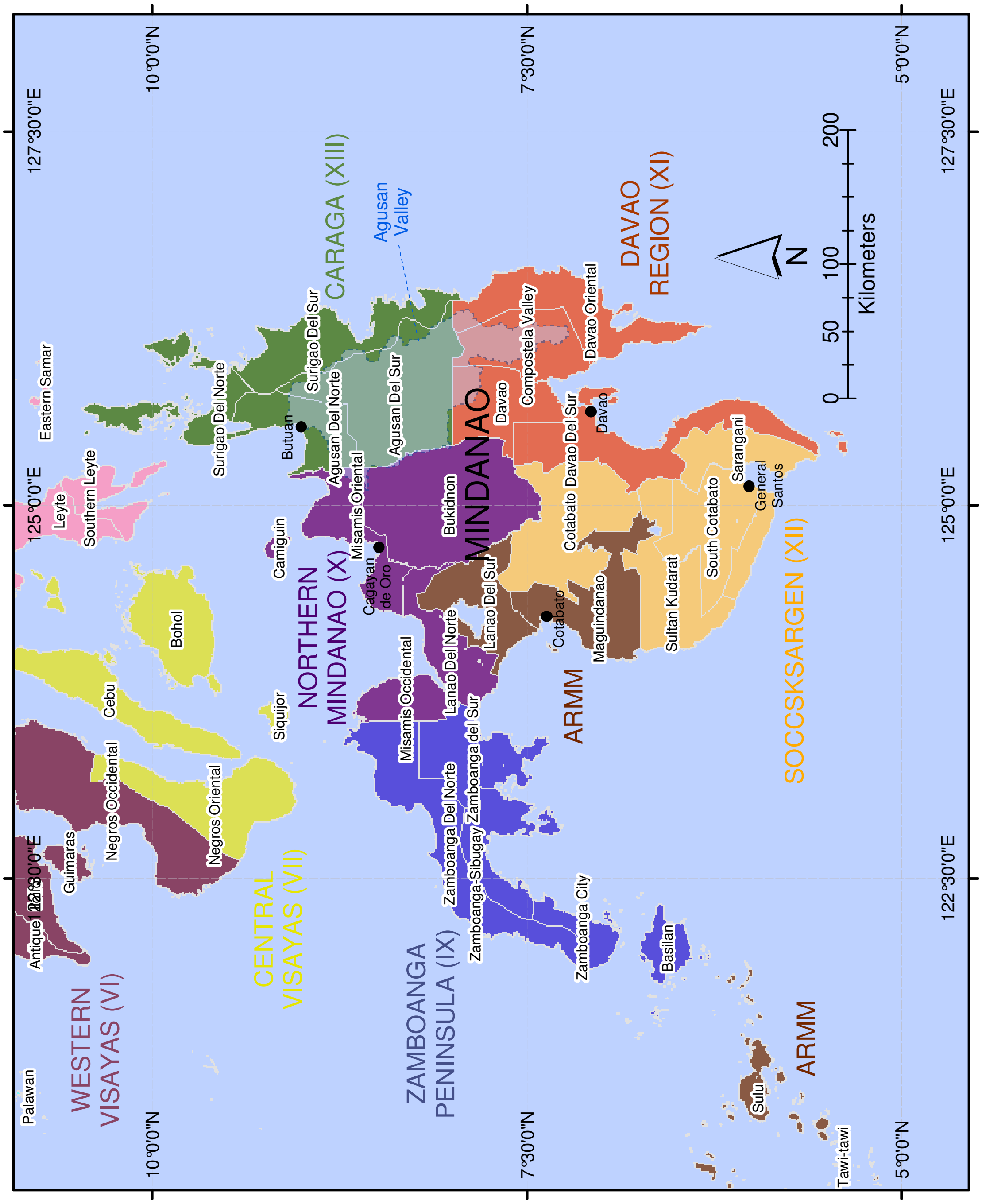


Fig. 3.3 – Mindanao, Regions and Provinces

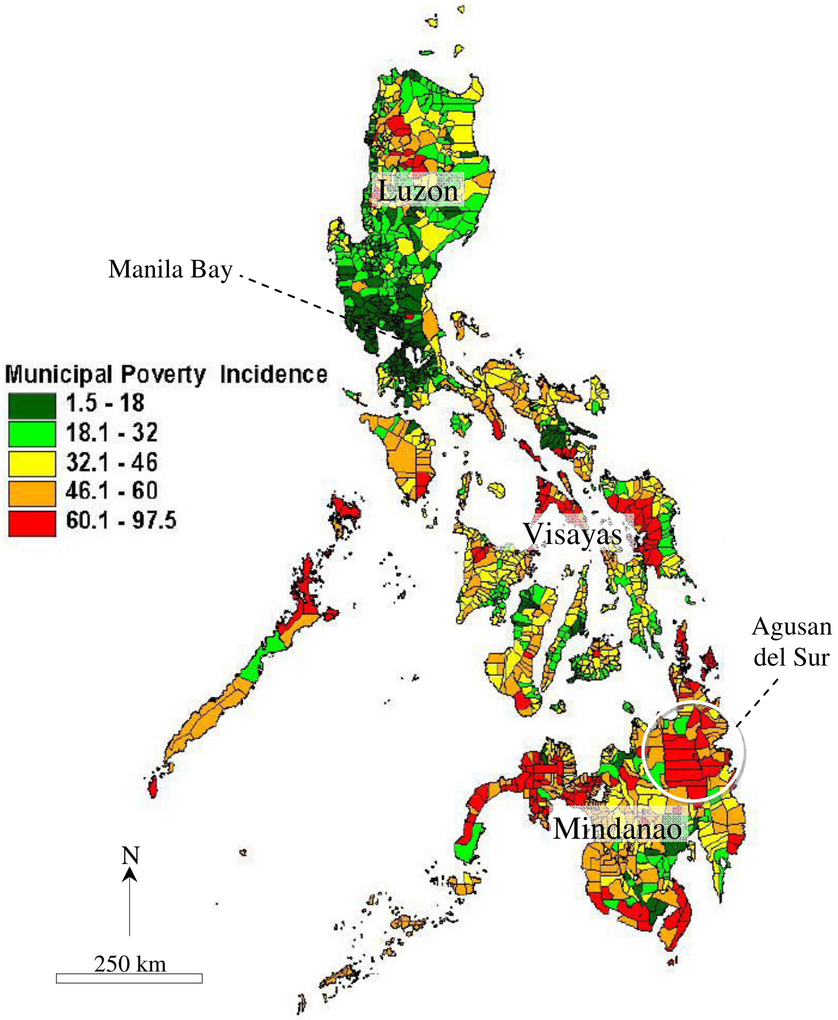


Fig. 3.4 – Poverty incidence in the Philippines in 2003 (NSCB, 2009)

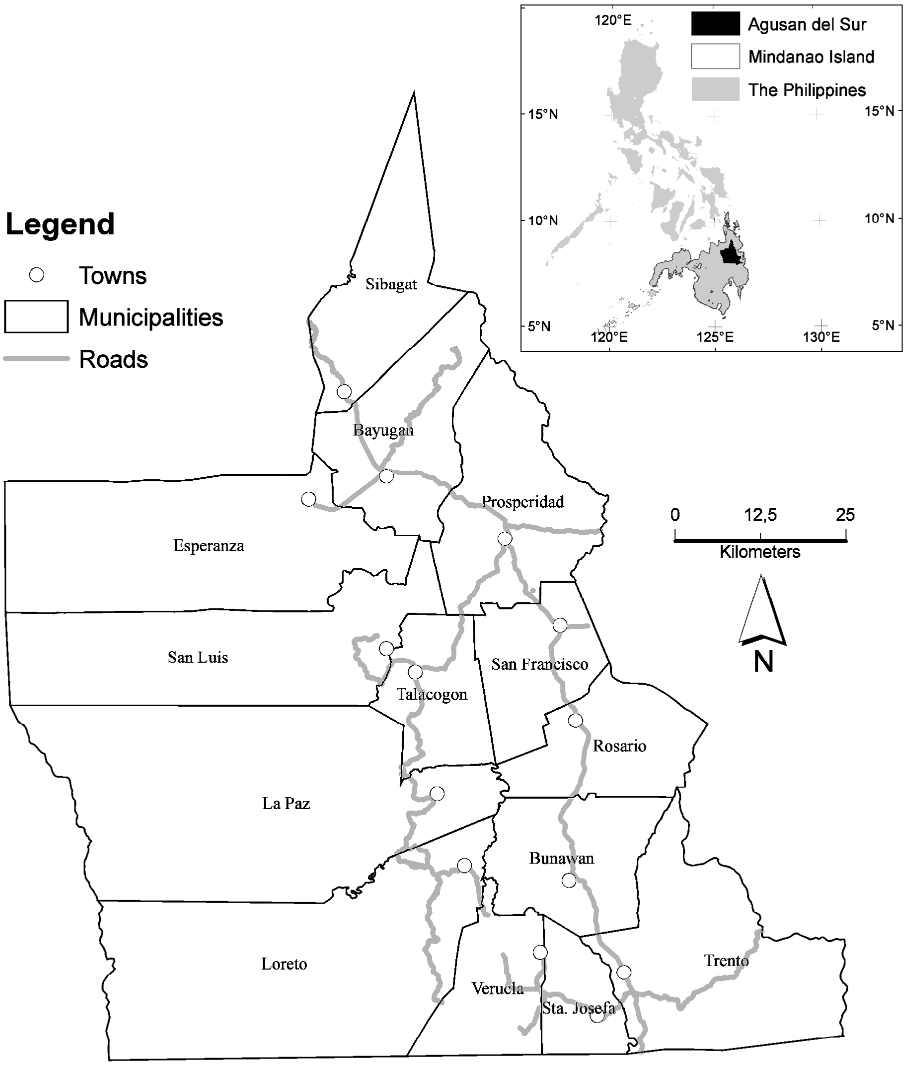


Fig. 3.5 – Agusan del Sur Province, location and municipalities

3.2 Historical context (background)

Agusan Valley was originally occupied by several indigenous communities such as the Manobos, the Mamanwas and the Higaonon. Archaeological excavations in the plains of Agusan plains have shown evidence of strong relationships between the region and several countries of South Asia. Augustinian missionaries in 1614 established a mission to Linao, near the current Bunawan. However, the mission has been hampered by the hostility of surrounding Manobo tribes. At the top of the power of the Sultanate of Maguindanao in the mid-17th century, the Manobos of Agusan Valley were allied with the Sultan Kudarat. Linao was attacked several times e.a. in 1629 (Caraga revolt) and in 1649 (Sumuroy revolt). Nevertheless, the missionaries were able to continue their mission and have remained there until the middle of the 19th century. At the end of the 19th century, the missionaries abandoned many of their missions, including those in the upper region Agusan, to the reconstituted Jesuit order. Indeed, the Jesuits were banned by the Pope in the 1760s, and ejected from the Philippines in 1768. The missionaries were interrupted by the Philippine Revolution during which the Jesuits fled or were arrested by the revolutionaries.

During the American occupation (1898-1946), logging has become an important activity in Agusan del Sur. Visayan migrants (from the Visayas) then settled in the plains cleared by pushing farther indigenous communities (IPs) in mountainous areas (uplands). The territory of Agusan del Sur was an integral part of the province of Caraga during most of the Spanish period. In 1860, it was placed under the authority of Butuan, a district of the province of Surigao. In 1914, the province of Agusan was created by the U.S. government. Agusan was divided into Agusan del Norte and Agusan del Sur in 1967 by Act 4979 (Republic Act No. 4979) (Souvenir Program, First Anniversary of Caraga Region, 1996). The main historical periods in the Philippines are given in table 3.1.

	Date
Pre-hispanic period	Before 1565
Spanish rule	1565-1898
American territorial period	1898-1946
Independent Philippines and the Third Republic	1946-1972
Marcos era and martial law	1965-1986
Fifth Republic	1986 to present

Table 3.1 – Main historical periods in the Philippines

Box 5 – A massive deforestation... with multiple causes

At the beginning of the 16th century, at the arrival of the Spanish colonizers, 90% of the Philippine territory was covered with primary forest (Pulhin, 1999; Bankoff, 2007). At the beginning of the 20th century, the forest cover decreased to represent 70% of the territory, and in 1950 only 49.1%. To the paddle of the 21st century, this figure was lower than 20% (based on satellite images classification performed by ESSC). This evolution can be divided in 3 periods: (I) the colonial period (1500-1945), (II) the postcolonial period (1946-1980) and (III) the recent period (since 1980 to present). (I) During the Spanish colonial period, of 1521 to 1898, illegal logging and the development of agriculture appear but these pressures on forest lands however remained negligible, since the human population was small. The phase of American

colonization (1898) marked the beginning of the development of industries in the forestry sector. (II) The postcolonial period did not bring any radical changes. The government continued to support and even reinforces the policies of forestry developments. The rate of deforestation reaches even the record figure of 150.000 has/y (Sajise, 1998). However, the Marcos administration formulated a number of programmes, in the seventies, in order to develop a sustainable management of the forest resources. Those will have only little success. (III) At the beginning of the years 1980, there is an awakening of the forest resources vulnerability and the potential role of the local populations to manage these resources.
The landscapes of all the Filipino areas were completely modified in one century. Philippines lost 63% of its forest cover between 1900 and 2000 with South Luzon (73%), Visayas (74%) and Mindanao (66%) as the most important rates of loss (based on figures from Bankoff (2007) and from DENR (Department of Environment and Natural Resources)).
The causes of deforestation in Philippines are multiple: logging, agricultural clearings, mining, forestry clearings (oil plantation), etc. According to Kummer (1992), the fast decline of the forest cover in the Philippines must be allotted mainly to the agricultural expansion and the logging (legal and illegal) of barks.

3.3 Population

3.3.1 Original population

The original population of Agusan del Sur was composed of different tribes speaking different languages. The first settlers were the Negrito and Mamanwas which were gradually pushed into the interior by migrants from Borneo, Sulawesi and Malaysia and also by Manobos. The few descendants of these original inhabitants still live isolated in the forests of Agusan del Sur.

Currently there are mainly two groups of "indigenous": the Manobos living along the highway or in towns and the Higaonon living in the west of the province, mainly in the municipality of Esperanza.

The Manobos come partly from intermarriages between aboriginal peoples Duyag-Batang, Talandig and Mamanua and Indonesians settlers during the Majapahit Empire (1293-1500). Manobos come also from marriages between indigenous and Malay settlers or Chinese traders who came in the Agusan valley during the 11th and 12th centuries. The arrival of Spanish colonialists had subsequently also contributed to what are now the Manobos. In Mindanao, there are eight groups of Manobos (Cotabato Manobos, Agusan Manobos, Didababawon Manobos, etc.). These groups are quite similar, differing mainly in the dialect they use and in some cultural aspects. These distinctions have emerged among others by their relative isolation. Thus, a group of individuals of the same country (Malaysia) led to several different ethnic groups. Traditionally, there is an assimilation of Manobos to the *Indigenous People* (IP) of Mindanao[24]. Their social structure is mainly based on a rather primitive farming, i.e. they use little or no modern technology.

The Higaonon Banwaon ethnicity is the second largest cultural community in Agusan del Sur. The concentration of this population is located in Esperanza on the border with Bukidnon and Misamis Oriental provinces. The Higaonon are mountainous people (Higaonon is derived from the indigenous word *gaon*, which literally means *mountain*). Nomads, they move from one mountain village to another in search of fertile land and better harvests. The Higaonon-Banwaon have particularly suffered of the arrival of migrants on their *ancestral domains* (Paredes, 1997).

For more information about IPs and Manobo see also Garvan (1941) and Villa (2007).

3.3.2 Growth and urbanization

The population of Agusan del Sur has experienced an important growth since WWII rising to 609.000 in 2007 from about 38,000 people in 1948 (source: Bureau of Labor and Employment Statistics). In 60 years, the population multiplied by 16. As we will see later, in-migration has played a significant role in that statement.

Urban polarization often associated to regional in-migration phenomena has remained moderate. In 2000, Caraga Region containing ADS Province stayed one of the most rural regions (Fig. 3.6) with a rural population rate of 73%. Namely 74% of total population of ADS lives in rural areas[25]. This rate being 3% higher ten years before expresses a slight urbanization phenomenon in the province. Throughout the province, more than 90% of the villages have experienced a population growth during the nineties (Fig. 3.7).

[24] Let us notice that the natives of Mindanao are also called *lumad*.
[25] Own calculation based on figures from National Statistics Office (2000).

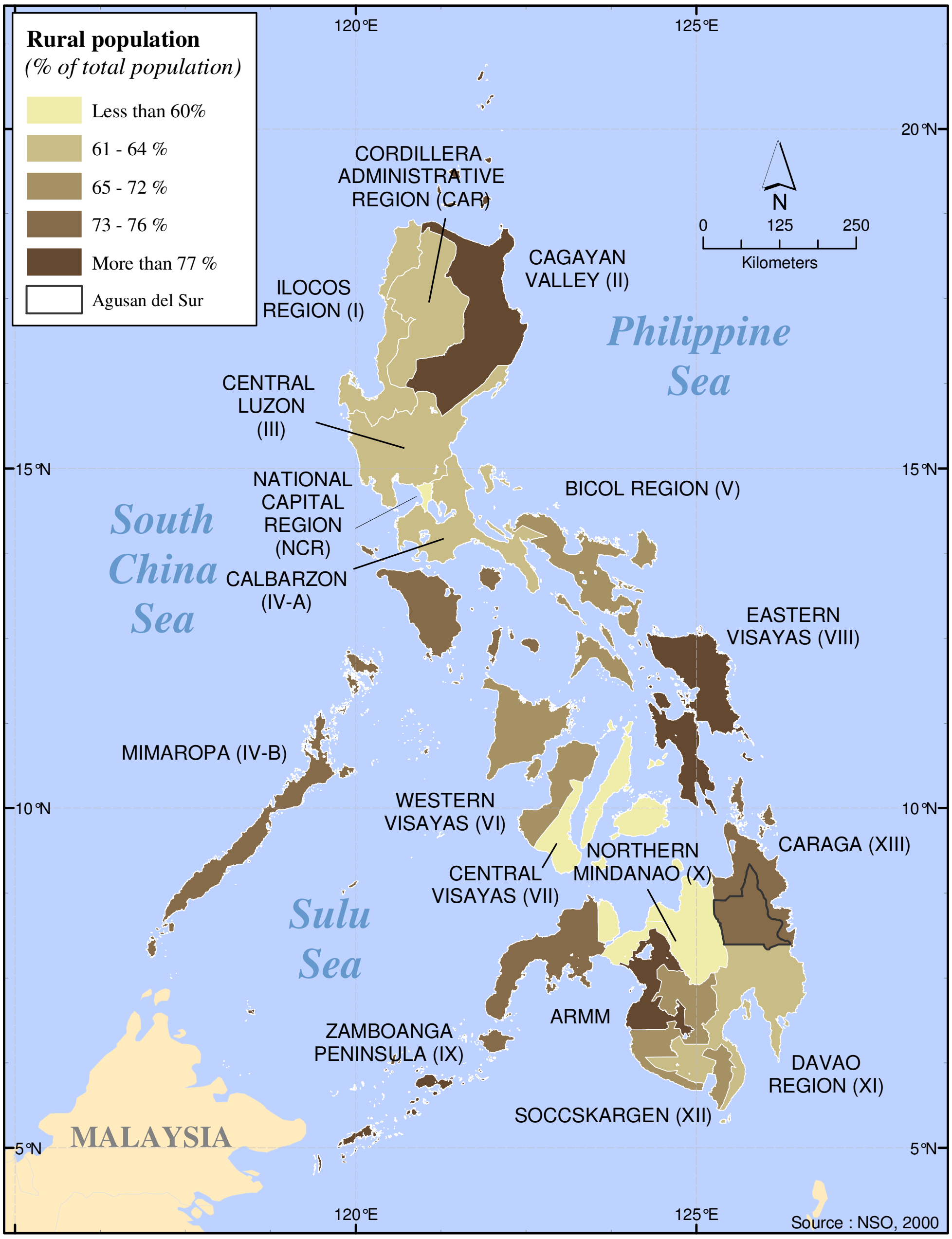


Fig. 3.6 – Rural population by region in 2000

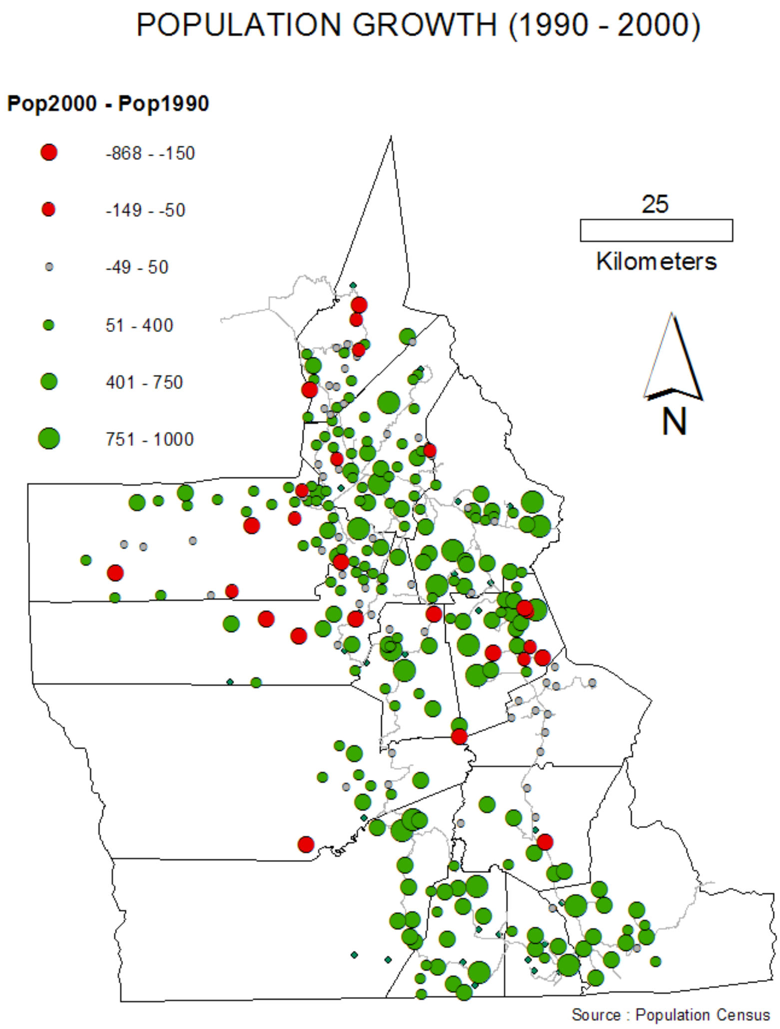


Fig. 3.7 – Population growth by villages (1990-2000) in ADS Province

3.4 Infrastructures, equipments and services

Infrastructure can be defined as the basic physical and organizational structures needed for the operation of a society or the services and facilities necessary for an economy to function (Sullivan and Sheffrin, 2003). The term typically refers to the technical structures that support a society, such as roads, water supply, sewers, power grids, telecommunications, and so forth.

The infrastructure, equipment and services in the province are declared inadequate (Miguel *et al.*, 1999; DH, 2006; ADB, 2008). Only 49% of the barangays have electricity and access to telephone communication is limited. The road network has a density of only 0.4 km per sq km (Miguel *et al.*, 1999). The *highway* is the backbone of this network (Fig. 3.8).

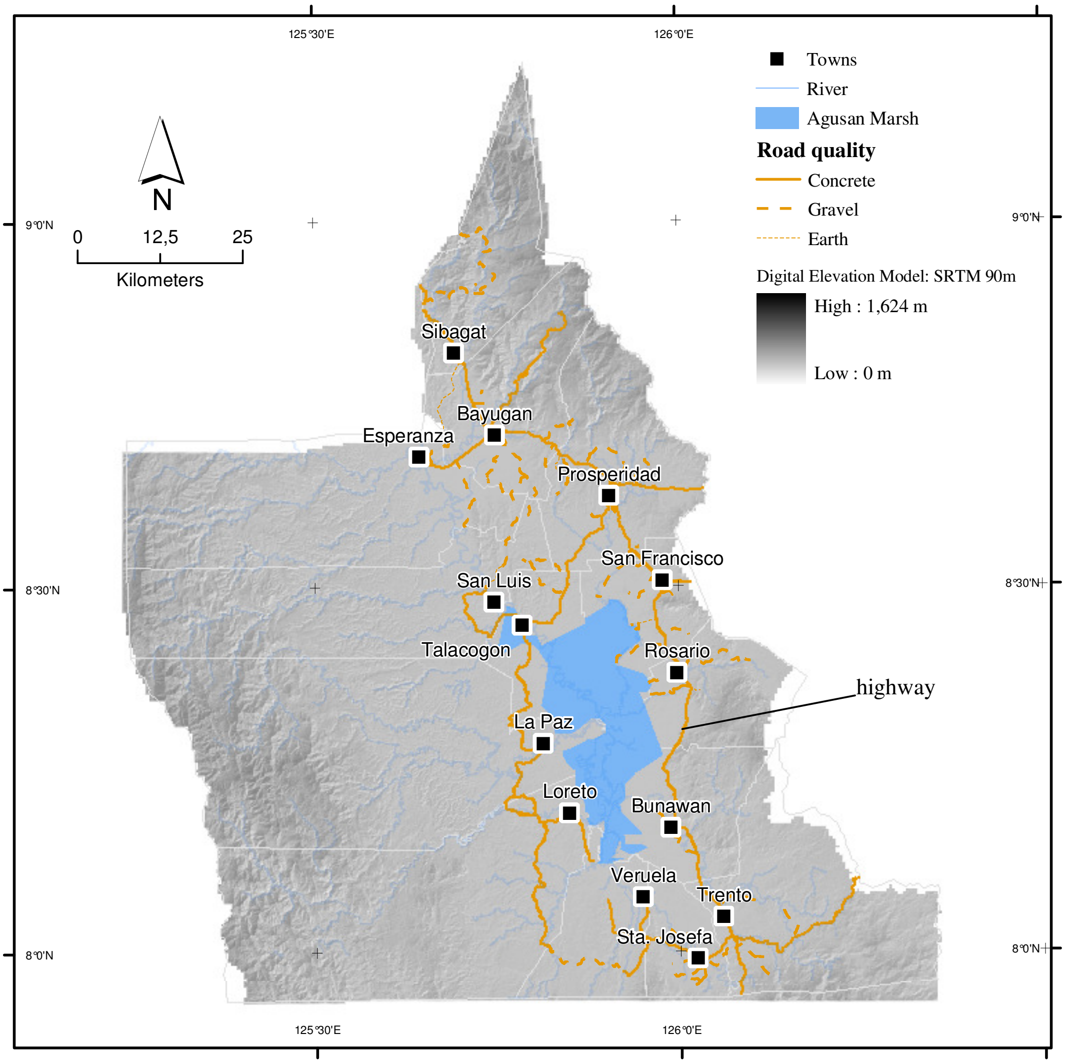


Fig. 3.8 – Road network in Agusan del Sur

Travels within the province are provided by public transport such as buses, jeepneys, motorcycles or pumpboats. However, the rates can be very expensive for local population, depending on distance, for pumpboats. Because of regular rainy episodes, roads are of poor quality, so that only the motorcycle has become the most viable transportation in the province. The roads are often muddy or completely flooded, making them unusable except for the *carabao* (local buffalo) which becomes the only real means of transportation. This context has a significant impact on local communities in terms of accessibility (Miguel *et al.*, 1999). Although they are distant only by a few kilometres from the towns or the highway, it often takes several hours for people to reach these places. As the Euclidian distance does not really make sense the time-distance should be considered in this context.

Agricultural infrastructures are considered as market-to-farm roads and farming machinery (or *farming equipment*). As shown by figure 3.9, Caraga Region experienced an important increase of the amount of agricultural infrastructures during the 70s and the 80s. A slight decrease is observed during the 90s[26]. This evolution is also noticed for most of other regions.

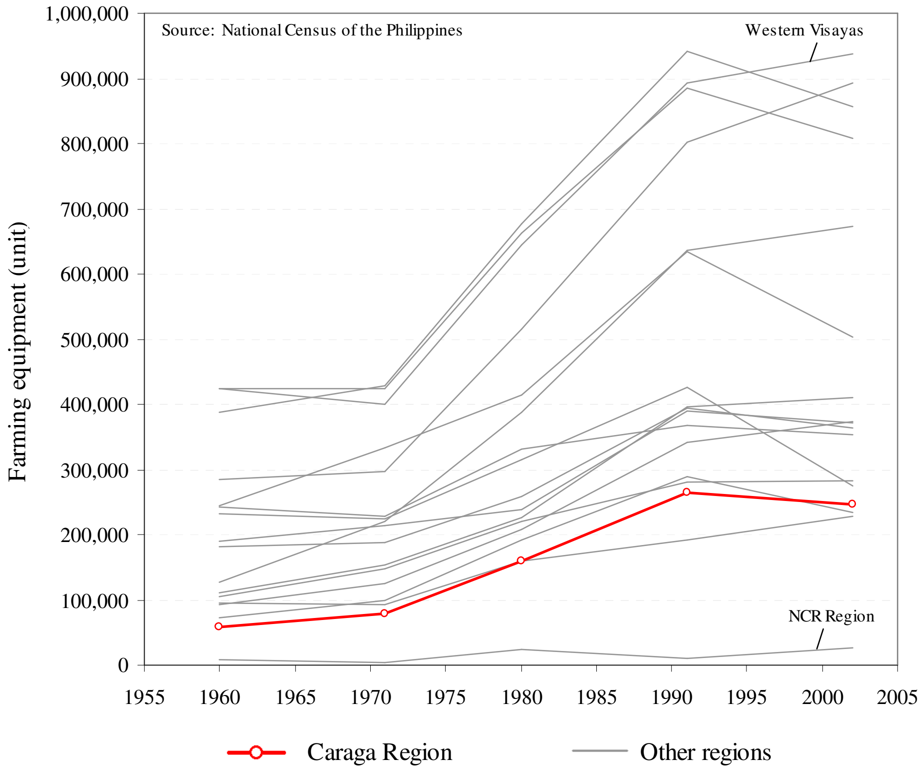


Fig. 3.9 – Evolution of farming equipment[27] in Caraga and other regions.

At the municipal scale, the distribution of farming equipment (Fig. 3.10) is not homogenous in particular because the surface of cultivated areas differs among the municipalities. San Francisco is clearly the *agro-centre* of the province with almost 20% of the provincial amount of farming equipment. Two other agro-centres are Veruala and Bayugan (13% of provincial equipment). In terms of density of farming equipment (number of farming equipment by cultivated area surface[28]), the three

[26] During this century, the number of plows, harrows and sprayers decrease while the number of tractors continued to growth.
[27] Farming equipment taken into account are plows, harrows, sprayers and tractors.
[28] Based on ESSC classification from 2003 Landsat ETM+.

municipalities having the highest density are Veruela, Bayugan and La Paz[29] (Fig. 3.11).

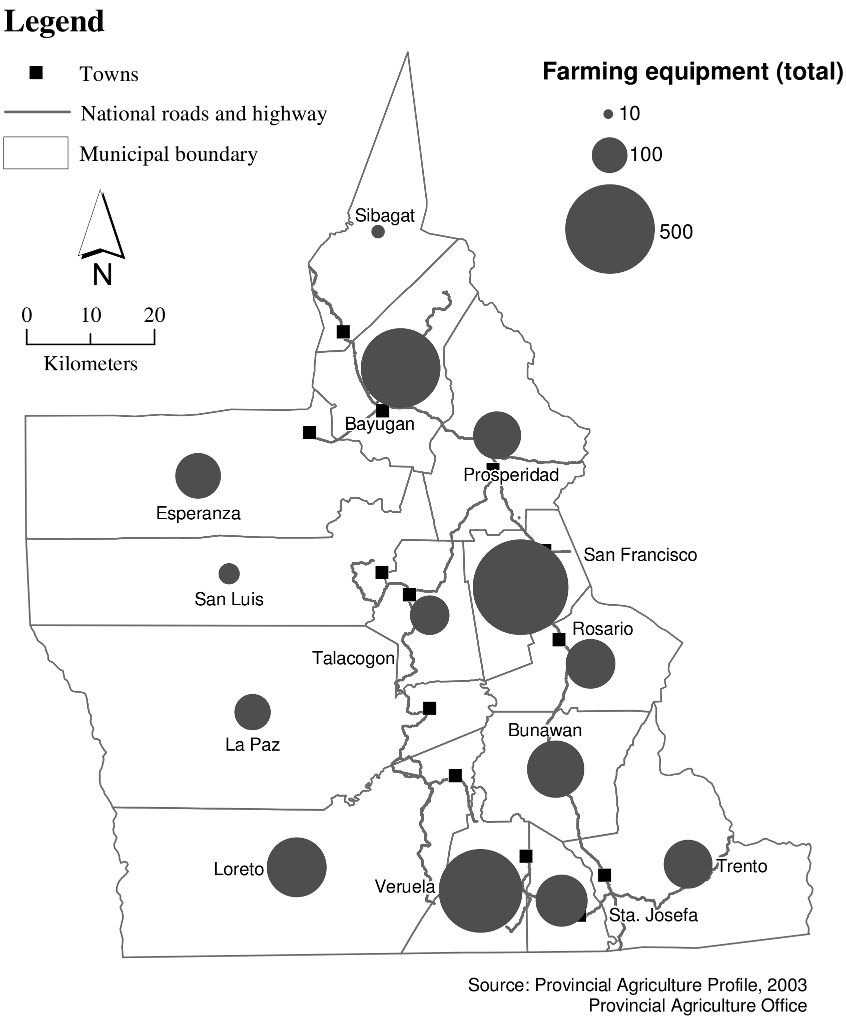


Fig. 3.10 – Farming equipment by municipality in ADS

[29] While La Paz has "only" 103 farming equipments, this municipality appears to be well equipped in comparison of the cultivated area (1.5 % of the municipal area).

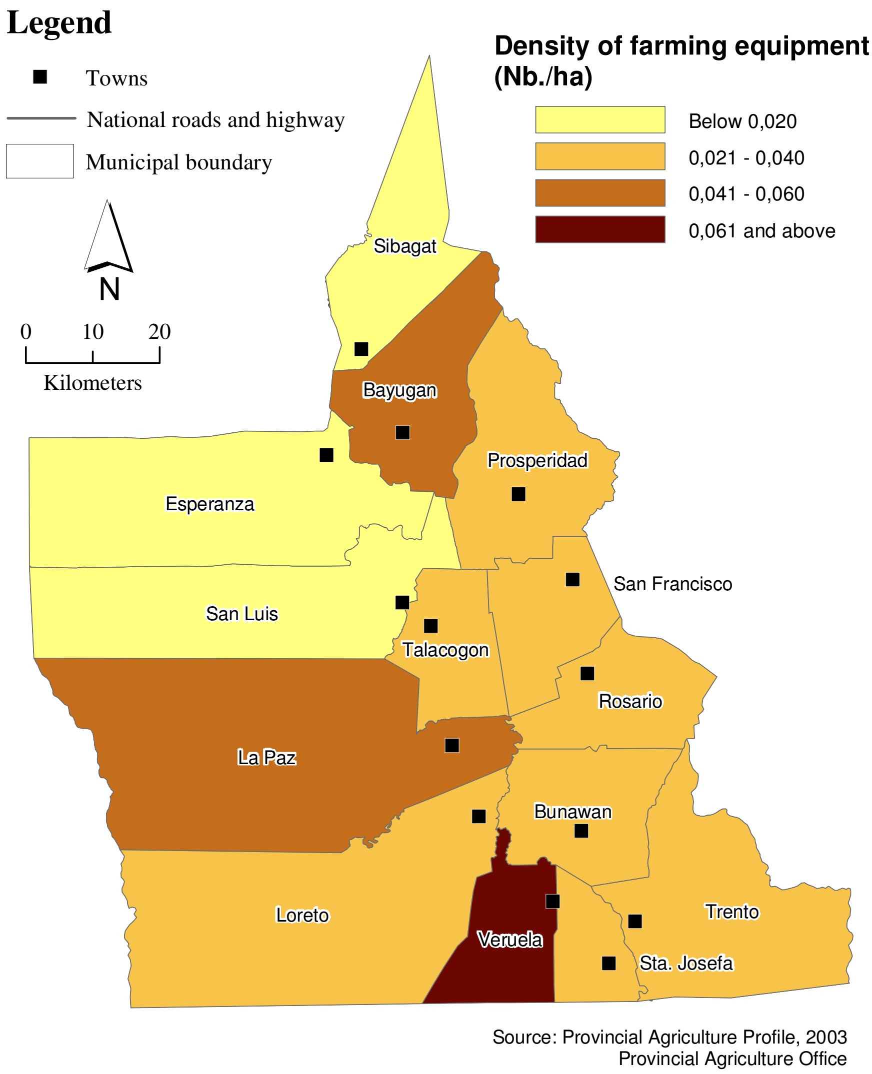


Fig. 3.11 – Density of farming equipment by municipality in ADS

These last two figures show – already at this stage – that there is a certain spatial heterogeneity throughout the province, here in terms of access to agricultural equipment. The analysis of this spatial heterogeneity will be a key step in identifying factors of marginality as we will see later.

We invite readers to read the newspaper article (*Philstar*, June 21, 2009) (annex 2) which reflects the importance of farming equipment to locally reduce poverty.

3.5 Main concerns in Agusan del Sur

In the province of Agusan del Sur a high level of resources particularly forest, plantations and water are available. Planning is essential in managing these resources to respond to social vulnerability and environmental sustainability, livelihood development and economic growth (ESSC, 2005). The Provincial Technical Working Group[30] (PTWG) has defined 14 key points of interest (Tab. 3.2):

	Points
1	Barangay Site Delineation
2	Barangays and Human Poverty Index
3	Conflict Management Process in CADC areas
4	Rattan Utilization and Management
5	Review of Community Based Forest Management Agreements
6	Co-Management Agreement in Forestlands
7	Illegal Logging
8	Post-Harvest Facilities and Agrarian Reform Implementation
9	Small-scale Tree Farmers
10	Timber Corridor : Shannalyne Concessions
11	Peace and Order : Forest-Related Violence
12	Management of Secondary Forest
13	Declared Watershed Management : Andanan and Wawa
14	Management of Agusan Marsh

Table 3.2 – The 14 key points defined by PTWG

The main concerns – excepted poverty which may be considered as a general consequence – in the province are for example (i) illegal logging, (ii) Peace & Order, (iii) water management or (iv) post-harvest facilities. These concerns, complex and interlinked, are detailed hereafter.

(i) Illegal logging
Logging is one of the primary livelihood strategies and sources of income in Agusan del Sur, especially among forest-dwelling communities. Logging also has a contribution to the provincial economy in the form of taxes, as well as a contribution

[30] On April 2003, the Provincial Technical Working Group of ADS was formed. It was a coming together – a convergence – of stakeholders from different government agencies and organizations in response to the increasing poverty in the area, which is often caused by people’s lack of empowerment in managing their resources. The group is developing working mechanisms and systems, methods and institutional structures that facilitate effective integration of environment and natural resource concerns to government policies (ESSC, 2005).

to the national government through forest charges. Illegal logging is generally understood to mean the harvest, transport, processing and selling of timber in breach of a country's laws. Illegal logging, when done in an intensive manner and at a large scale, can destroy forest ecosystems, result in losses to the local economy, create local conflict (see point (ii) below), and it is a major disincentive to sustainable forest management. Illegal forest activities have worsened the poverty problem especially in upland communities. Forest communities started to engage in illegal activities for subsistence and livelihood purposes (ESSC, 2005). Hotspots for illegal logging are concentrated in forestland barangays. The table below (Tab. 3.3) gives an idea of the volume of confiscated forest products and their estimated value last years.

Year	*Total volume (m^3)*	*Estimated value (Php)*
2002	5,965.36	393,088.00
2003	56,877.36	2,962,798.11
2004	34,245.21	1,003,065.80

Source: PENRO, 2004

Table 3.3 – Volume and estimated value of confiscated forest products in ADS

(ii) Peace and Order

We may classify Peace and Order (P&O) problems in ADS Province into two categories. On the one hand, we may consider natural resources conflicts. In fact, the whole economy of Agusan del Sur relies on natural resource extraction and agriculture. Agusan del Sur is for decades and decades a major source of logs (Kummer, 1992) and raw or semi-processed rattan (de Jesus and Bantug, 2003) and historically, and for much of its existence as a local government unit, the province has relied mainly on logging and the gathering of rattan and other minor forest products. Since then, the contribution of tree plantations and commercial crops, including rice, oil palm, rubber and fruits, to the local economy has grown (ESSC, 2005). Logging from the natural forests has generally declined (Guiang, 2001), although there are occasional upward spikes due to cases of timber poaching. Still, due to the change in practice and the wide-range of options for natural resource extraction, along with the numerous claims on forestlands for other uses by a fast-growing population, numerous conflicts on natural resource use have set in (ESSC, 2005). Violence has erupted in cases of illegal logging and contested mining claims. People go into these ventures expecting very high profits and easy cash, yet the rules of the game are not clear-cut. Illicit financing arrangements and "turf wars" are the most immediate causes of violence (ESSC, 2005).

On the other hand, other conflicts find their root in political divergences. Regular armed encounters between NPA (*New People's Army*, the armed wing of the *Communist Party of the Philippines*) and the Philippine Army (PA) are observed.

(iii) Water management

The Asian Development Bank (ADB, 2004) observes that the Agusan River, which could be tapped for its abundant water resources, is not being fully utilized to generate economic growth and development. Water supply is insufficient in the dry season and, sometimes, prolonged drought brings major damage to agricultural production. During the wet season, recurrent overflow of the river brings serious and enormous damage to lives, properties, and agricultural crops as well as to infrastructure facilities that support agricultural activities. This issue is important to avoid conflict of interests in water allocation and resource transfer from downstream to upstream communities.

(iv) Agricultural facilities

PTWG has developed an *action point* on post-harvest facilities (mill, thresher, sheller, warehouse, depulper, etc.). Indeed, there is a real lack of processing centres for agricultural products in Agusan del Sur. The province's goal is to develop appropriate post-harvest facilities for timber and other agricultural products, in order to achieve value-added benefit for the province's goods (ESSC, 2005). Agusan del Sur only produces raw materials, which are processed in Davao, Butuan or Cagayan de Oro. Despite the province's status as the timber and food basket capital of the region, the bottom line is that without any post-harvest processing, the province is unable to get the maximum economic benefit from its products.

(v) Other concerns

Other concerns and problems have been expressed by the local population in their *Development Plans* documents like the lack of school facilities and materials, the lack of health facilities and difficulties in transportation.

3.6 Conclusion

Agusan del Sur, one of the poorest provinces of the Philippines today, has experienced foreign influences since the nineteenth century. The Spanish missions and American colonization have rapidly led the Philippines to adopt a capitalist logic mainly after World War II. Early, Agusan del Sur looks like the *promised land* due to its huge natural capital. Attracting rural migrants as well as a lot of extractive companies (logging and mining), natural resources, particularly forests, will quickly be altered although its potential is still significant today. Early P&O issues appear due to conflicts of interest. Within the province – mountainous, swampy and with poor transport infrastructure – it is not easy to travel and, consequently, the entire provincial population has no access to basic needs, market, or politics. There is a real *paradox* in Agusan del Sur (Fig. 3.12): there are abundant resources but people are poor and while the land is vast, the province experience *overlapping of claims*.

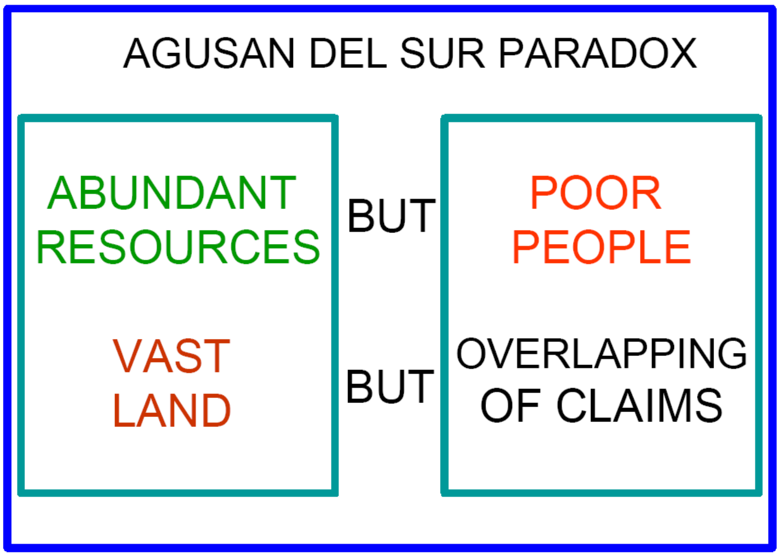


Fig. 3.12 – The Agusan del Sur paradox

Chapter 4

Migration trends

In the previous chapter we focused on the historical, demographic and infrastructural contexts and we presented the main concerns observed in the province of Agusan del Sur. In the present chapter, we stay on the migration trends since the beginning of the last century in Southeast Asia, for the Philippines and for Mindanao. Then we focus on Agusan del Sur and its municipalities. The literature shows that the north of the island of Mindanao is an area that continuously welcomes many migrants for decades and decades. Despite an important lack of migration data, we can make a quantitative and qualitative inventory allowing us to have a first overview of the mechanisms that led hundreds of thousands of people to migrate to Mindanao, particularly to the northeast part. We also dwell on the determinants of migration to Mindanao reported in the literature. Finally, we present the migration trends in four villages based on field surveys conducted by us. Information gather in the present chapter will support us further, in particular for the understanding of *migration-marginality nexus*.

4.1 Internal migration in Southeast Asia

Internal migrations have existed for ancient times in Southeast Asia driven by various motivations. There is a series of evidence, derived from empirical observation throughout Southeast Asia (Fig. 4.1) that the mobility of the population has increased at an exceptional rate over the past two decades (Deshingkar, 2006). Already in 1974, Ng in *Internal migration in Southeast Asian countries* observed such important movements.

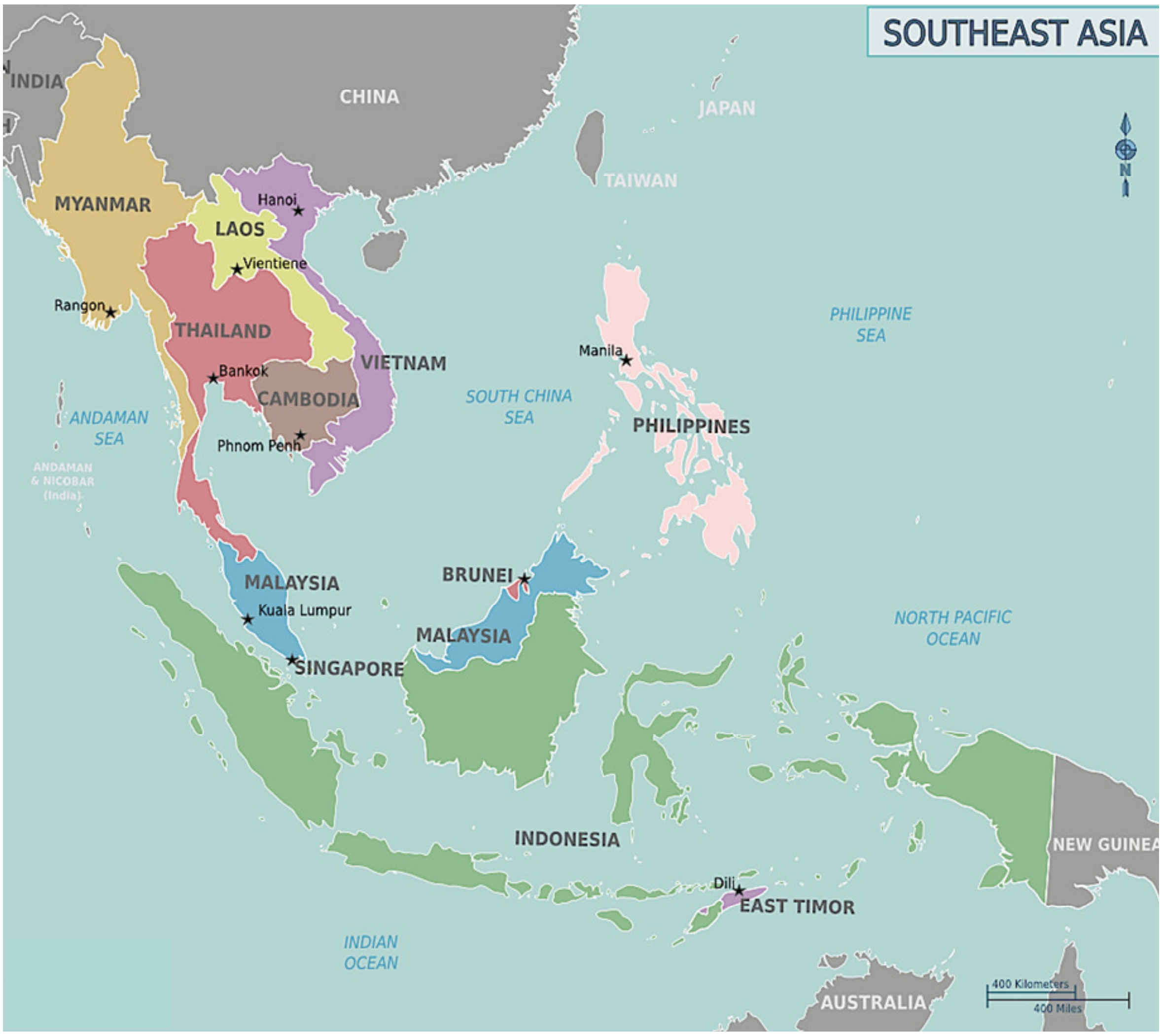


Fig. 4.1 – Southeast Asia

"Inter-rural" migrations were due to population growth beyond the capacity of land (*carrying capacity*) within the limits of the technology at this time. People therefore migrated to the "border areas" (*frontier areas*) with high not yet fully exploited agricultural potentials. Local concentrations of population are therefore linked to plantations or mining sites. Ng noticed that migratory pressures caused by an *in situ* progressive population growth led to a continuous *accretional* growth. The reactions to this challenge were very different from one region to another and from one culture to another. Geertz (1963) speaks about *agricultural involution* in Indonesia: land, cultivated more intensively, does not lead to a significant growth in living standards (see box 2).

Deshingkar (2006) comes, thirty years after Ng, to some similar conclusions. The current migrants are still attracted to areas with high agricultural productivity. Regional disparities in terms of productivity and wages are still observable and are mainly due to differences in the levels of mechanization. Nevertheless, some recent studies show changes in migratory preferences. A survey on five thousands migrant households in 2004 in Vietnam has shown that temporary migration to industrial zones was growing while at the same time, rural-to-rural migration to the Central Highlands were reduced along with the prices of some agricultural products. The same observations (increasing rural-to-urban migrations to the detriment of intra-rural migration, i.e. a transfer of rural agriculture» areas to "urban/non-farm" areas) were also made in India (Karan, 2003; Jha, 2005). As stated Deshingkar (2006, p.6), “while it is not possible to say that these studies show a definite trend, it is likely that urban and manufacturing opportunities will become more attractive to internal migrants”.

4.2 Internal migration in the Philippines

In the Philippines, internal migrations are significant. Between 1960 and 1970, nearly 5 million people (13% of the total 1970 population) have made internal migration. Between 1970 and 1980, 5.4 million Filipinos have conducted intra-national migration[31]. Between 1985 and 1990, they amounted to 3.24 million (Flieger, 1996). No more recent data exist[32] but a number of elements indicate that internal migrations remain significant. There is a real necessity to study internal migration in the Philippines. As Gultiano (2004, pp. 8-9) mentions: “much of the literature on internal migration in the Philippines is a result of the analysis of census and survey data in the 1960s and 80s. In the 1990s, however, most of the interest on migration shifted to international migration, creating a dearth of knowledge on more recent patterns and trends in internal migration”. Fig. 4.2 below shows clearly that internal migrations are increasing in the Philippines since the 1960s.

[31] 2.85 million during the 1975-80 period.

[32] “Internal migration in the Philippines has been discussed by many authors (Wernstedt and Simkins, 1965; Population Institute, 1966; Krinks, 1970, 1974, 1975; Kim, 1972; Simkins and Wernestedt, 1971; Bulatao, 1976; Fleiger *et al.*, 1976; Smith, 1977; Ulack, 1977; Pryor, 1979; Abad, 1981; Institute of Population Studies, 1981; National Census of Statistics Office [NCSO], 1981; Bernardo, 1982; Conception, 1983; Abejo, 1985; Perez, 1985; Nguiagain, 1985; Zosa-Feranil, 1987)” (Kummer, 1992, p. 78) but all of them study trends and flows before the nineties.

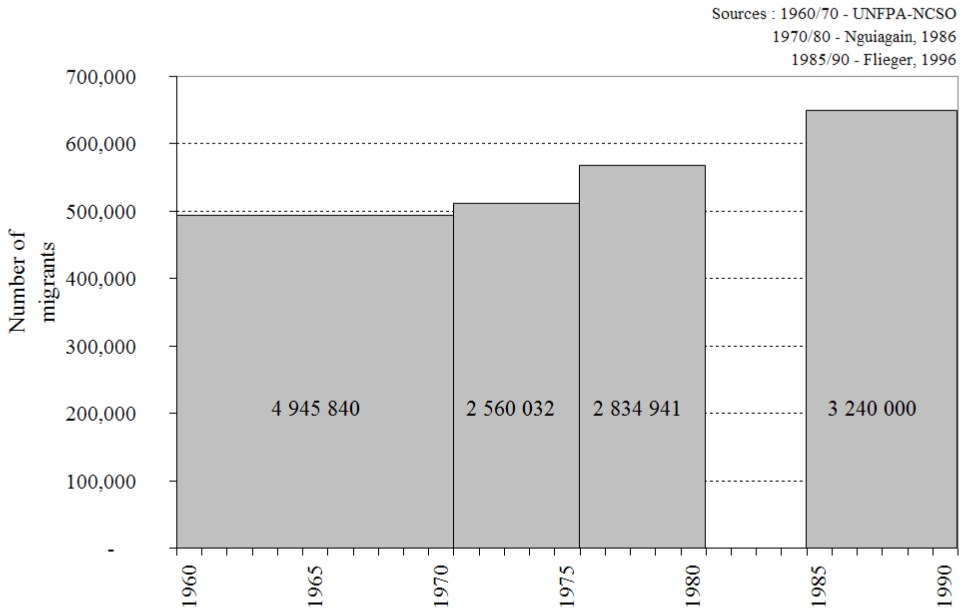


Fig. 4.2 – Internal migration between 1960 and 1990 in the Philippines

Proportion of different internal migration flow patterns in 1965 and 1973 are given in table 4.1 below (from Herrin (1980) and Bilsborrow (2002)).

Source	Year	Rural to Urban	Urban to Urban	Rural to Metro	Rural to Rural	Urban to Rural	*Rural destination*
Herrin (1980)	1965	30.0	-	13.0	33.0	-	*33.0*
Herrin (1980)	1973	25.0	30.0	15.0	20.0	10.0	*30.0*
Bilsborrow (2002)	1973	39.3	25.2	N/A	19.7	15.8	*35.5*

Table 4.1 – Proportion of internal migration flow patterns in 1965 and 1973 in the Philippines

It appears that migration to rural areas were really significant (more than 30 percent) during the 1965-1973 period[33]. No more recent statistics were gathered about internal migration flows for all the Philippines and it is difficult to have an accurate knowledge of which internal migration pattern prevail today.

[33] Let's notice that differences between the two authors are due to the fact that Herrin considers five patterns while Bilsborrow four. Indeed, Herrin considers also the *metropolis* as possible destination. Metropolis is defined as a large and densely populated urban area and may include several independent administrative districts. There are 12 metropolitan areas throughout the Philippines including Metro Manila.

According to the UN perspectives, the Philippine rate of change in urban population would decrease from 4.4 (1975-2000) to 2.4 (2000-2025). Hossain (2000) estimates that the Philippine rural population will decrease slightly, from 31 millions (in 2000) to 29 millions (in 2030). So, a stabilisation would appear and in 20 years a large amount of Filipinos still depend on the rural economy (Fig. 4.3).

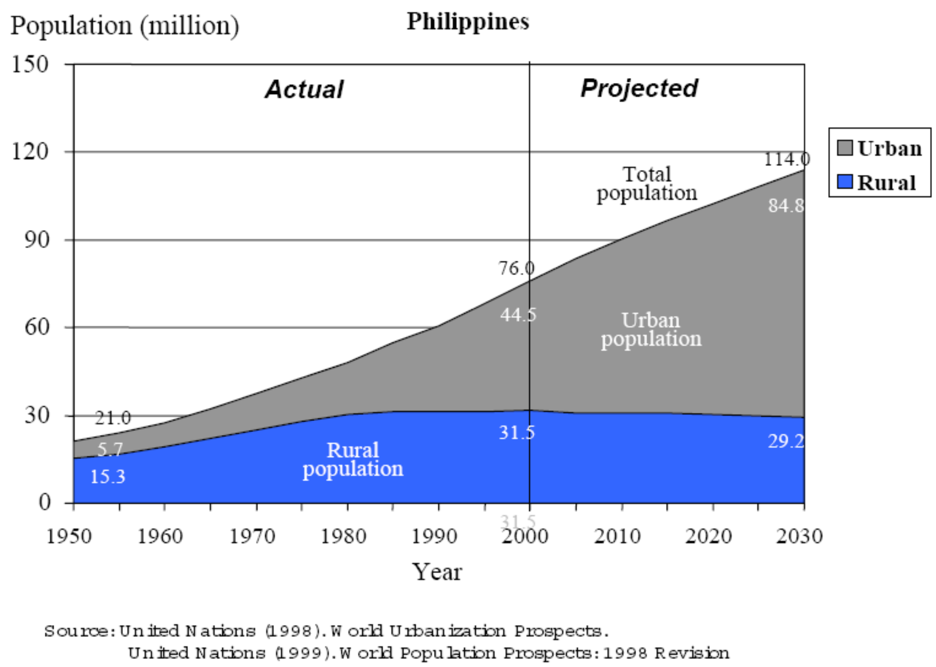


Fig. 4.3 – Trend in urbanization in the Philippines (Hossain, 2000)

During the twentieth century three major streams of internal migration in the Philippines were observed (Fig. 4.4) (Pernia *et al.*, 1983; Orbeta and Pernia, 1999; Herrin, 2002):

- The first flow during the 50s and the early 60s was characterized by frontierward movement. This rural to rural stream was mainly composed by men associated with agriculturally-based motivations. They came from Luzon and the Visayas to Mindanao (Davao Region, Zamboanga Peninsula and Northern Mindanao) and Cagayan Valley. These population movements were a response to the rich agricultural resources in *frontier regions* and to the resettlement programme of the government in the 50s. Because of the shift of economic activity away from the Visaysa, Ilocos and Bicol, these traditional agricultural regions (TAR) became the sources of migrants (Pernia *et al.*, 1983). National Capital Region (NCR) had also – during this period – high in-migration and net migration rates. This movement is consonant with the nation's post-war industrializing trend in the direction of Manila.

- The second stream, in the 70s, was directed to urban areas. The main destination was the National Capital Region (NCR) and its periphery (Central Luzon and Southern Tagalog[34]). This movement was dominated by young and single women with low education level. Mindanao regions and Cagayan Valley lost some of their attractiveness but remained net absorbing regions. Population movements during the 60s signalled a shift from a frontierward to an urbanward orientation.
- The third stream in years 80s and 90s was urban to urban, from overcrowded Metro-Manila to suburban and peripheral areas of the metropolis (Go *et al.*, 1998; Go, 2002). This pattern of temporary circular migration between the metropolitan core and its periphery is expected to continue in the future (Perez, 1999).

Concomitantly to these major streams, rural-to-rural flows have remained significant since World War II as mentioned above.

[34] Southern Tagalog, or Region IV, was a region of the Philippines that is now composed of Region IV-A (CALABARZON) and Region IV-B (MIMAROPA). Region IV was split into the two regions on May 17, 2002.

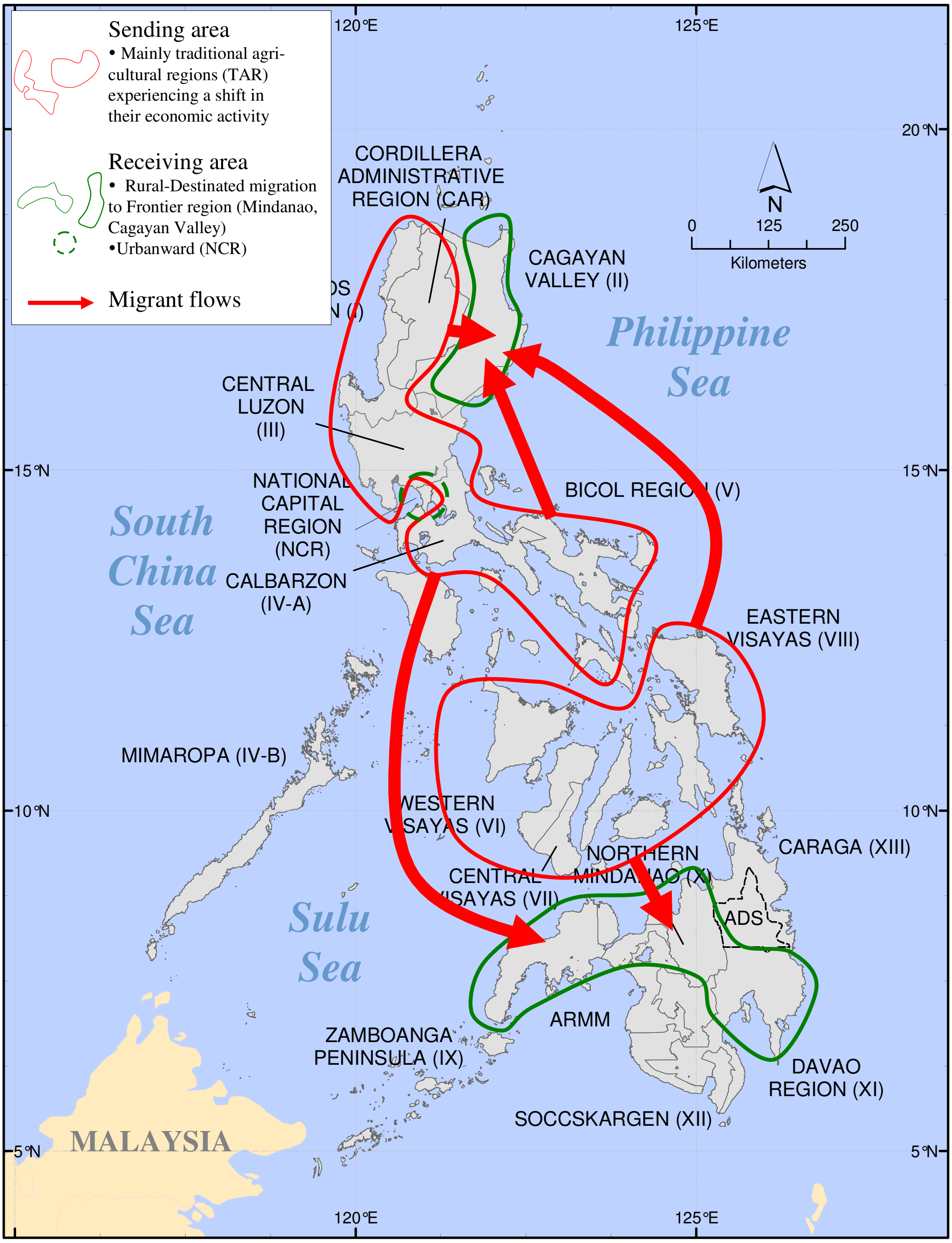


Fig. 4.4a – Main migration streams in the Philippines during the 50s and the 60s

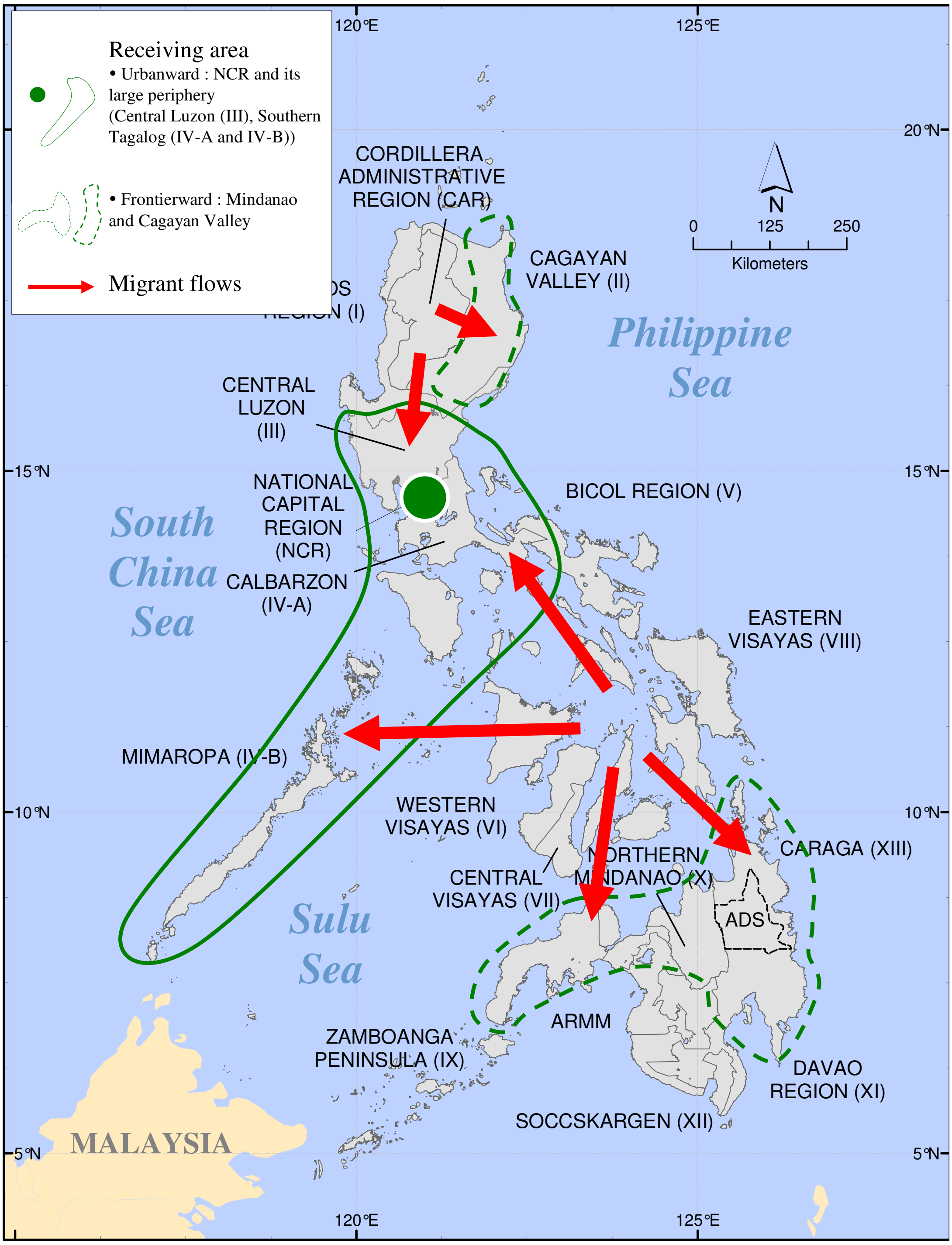


Fig. 4.4b – Main migration streams in the Philippines during the 70s

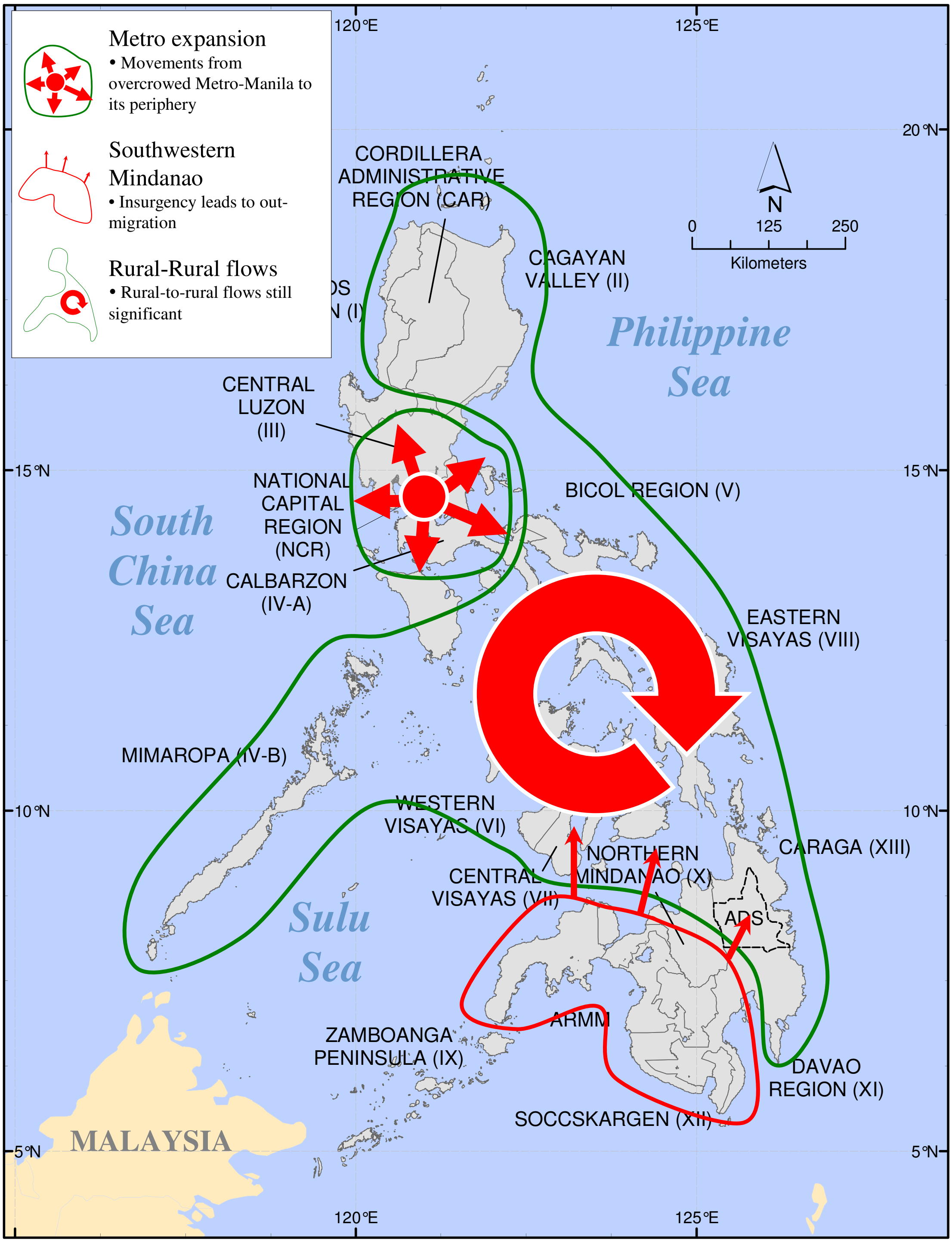


Fig. 4.4c – Main migration streams in the Philippines during the 80s and the 90s

4.3 Migration on Mindanao

During the twentieth century, the population of Mindanao has increased spectacularly, and especially after WW2 as shown by figure 4.5 below.

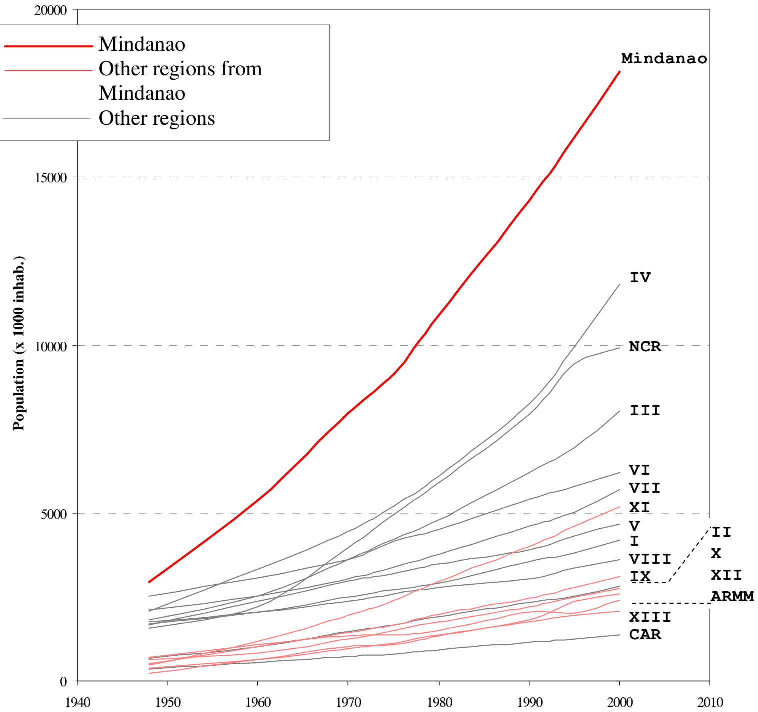


Fig. 4.4 – Population evolution by region (1948-2000)
(source: Census of the Philippines)
[NCR: National Capital Region, ARMM: Autonomous Region in Muslim Mindanao, CAR: Cordillera Administrative Region]

The growth of population on this island has been stronger than anywhere else in the Philippines and is mainly due to an important in-migration (Ulack, 1977). Initially a major reason for these in-migrants was the ratification of the *Public Land Act* in 1903 by which the *homestead* system in the Philippines was introduced. The settlers (farmers) were able to acquire small plots of land to cultivate. While there was no immediate response to the availability of land, colonization of the island began to be more and more manifest over the years.

The most important migratory periods were 1918-1939 and 1948-1960. During both periods, the population of Mindanao grew at a rate more than twice the national average. The first migrants were farmers and settled in the lowlands although some of them were also installed in the coastal cities of the island such as Davao in the south-east or Zamboanga in the extreme south-west. The period 1939-1945 witnessed a quite low increase although it may estimate that there were some 300,000 in-migrants during this period (Ulack, 1977). During the period 1948-1960, 1.25 million people in-migrated to Mindanao (Wernstedt and Simkins, 1965). During the decade 1960-1970, this figure reached 725,000 individuals, with an annual growth rate of 4.1%. In summary, during the first seventy years of the twentieth century, more than 4.25 million people joined Mindanao.

This important in-migration is not surprising since, as noticed by Huke (1963) approximately 4.4 million of Mindanao's total 9.9 million hectares, or forty-six percent, were cultivable at the beginning of the century. During the late seventies, the agricultural population had surpassed what the government defines as ideal (Ulack, 1977). Indeed, the average farm size is less than 12 hectares, as put forward by Huke (1963)[35]. This will be the beginnings to the land pressures that the province experienced later.

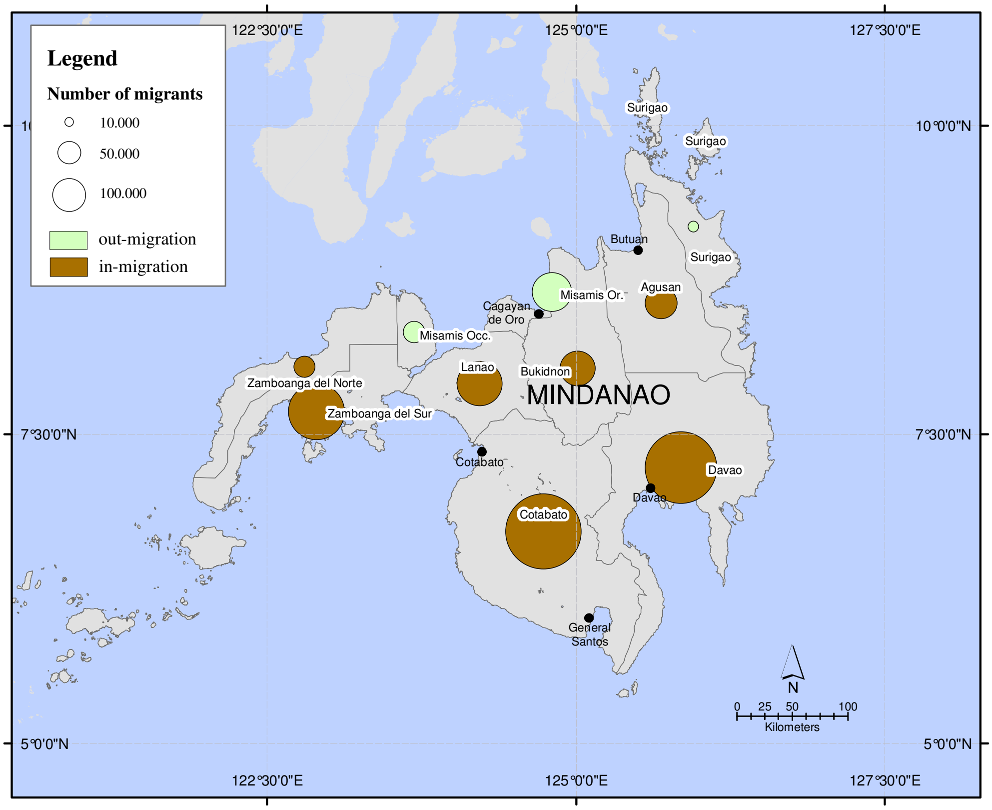


Fig. 4.6 – Net migration (1948-60) by former region within Mindanao [adapted from Wernstedt and Simkins, 1965]

[35] Quoted by Paunlagui and Suminguit (2001).

Within Mindanao, in-migration fluxes were not homogeneous. Between 1948 and 1960, further south of the island (Davao and Cotabato) has experienced significant entry of migrants (Abinales, 2000) (Fig. 4.6) while two interior provinces (Bukidnon and Agusan[36]) have also known very important growth rates. It should be noticed here that a few provinces have experienced the phenomena of out-migration and population growth rates below the national average (Misamis, Surigao and Zamboanga Peninsula). One explanation is that Surigao is regularly hit by typhoons that inherently limits the agricultural productivity and maintains the arable land area quite small in the Misamis provinces. In the Zamboanga Peninsula, the observed out-migration would be due to confrontations between Catholics and Muslims. A large literature talks about the "conflict-born out-migration" in Mindanao (see Tigno, 2006; Schiavo-Campo and Judd, 2006). Heterogeneity is observed in the *urban-rural* duality. Urban areas in Mindanao have also attracted a large number of people due to their booming economy.

Few studies have investigated migration to Mindanao since the mid-sixties and the migration flow is only studied at a very local scale or only in urban areas (Krinks, 1970; Ulack, 1974; Ulack, 1975; Ulack, 1976).

Ulack (1977) has analyzed the migration trends within Mindanao between 1960 and 1970 (Fig. 4.7). It appears already on this map that Agusan del Sur was clearly an in-migration province during this decade.

[36] Agusan province was divided into two distinct provinces (Agusan del Norte and Agusan del Sur) in 1967.

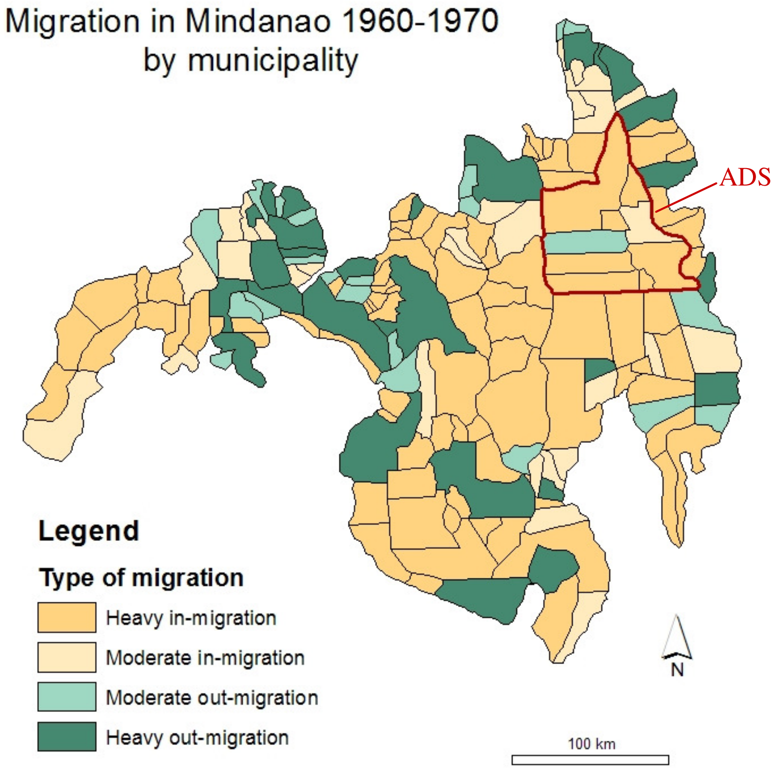


Fig. 4.7 – Migration in Mindanao 1960-1970

Box 6 – The expected impacts of migration on Mindanao

The expected impacts of migration can be very different and depend on the regional context. The effects of migration on Mindanao's development allowed an optimistic perspective for the island according to Ulack (1977). Indeed, he saw the ethnic heterogeneity of migrants (*heterogeneous migrant ethnic stock*) and the positive selection of migrants (*positively-selected migrants*), as potentialities to migrants to be *ready for change*, to a middle class to emerge in Mindanao. The arrival of new migrants therefore accompanied the arrival of more complex structures than those previously existing [traditional, domestic and agricultural] and put in place a population which manifests *anticipatory urbanization*. This population, consisting of individuals most susceptible to modernization, could lead, according to Ulack, to new farming communities based upon urban structural principles. This could even lead to upward social mobility through commercial agriculture (Hackenberg and Hackenberg, 1971). Ulack will even assert that it is through such interaction between farming communities and cities that modernization will begin. The originality in these findings is that this early urbanization had not been observed at the time elsewhere in the Philippines, in colonized agricultural areas where, on the contrary, an *agricultural involution* was observed, a phenomenon described by Geertz (1963) (see box 2).

Today, the Ulack's optimism - in the late seventies - is less clear. Of course interactions have been logically created between rural and urban areas, between farmers and traders. However, other variables came disrupt the "forecasts" described above. In the late seventies, martial law was proclaimed, which marked the beginning of a repression period and insecurity, unfavourable to development (e.g. unfavourable to the development of rural-urban links). The timber industry was largely based in Mindanao during the eighties and, in some ways, has also disrupted the context, however favourable, described by Ulack.

Between 1960 and 1970, some 276,000 in-migrants have settled in ex-Region X[37], while 128,000 (source: UNFPA-NSCO) left the region over the same period. Ex-Region X was therefore very attractive and in particular the provinces of Bukidnon and Agusan del Sur as shown by figure 4.8 below. Ex-Region X was the third most attractive region after Region IV (including Manila) (866,000 in-migrants) and Region XI (Davao Region, 371,000 in-migrants). The area providing the most in-migrants was mainly Region VII (Central Visayas) (nearly 120,000 migrants). The reader will find complete figures of 1960-1970 inter-regional migrants by region of origin and region of destination in annex 3.

[37] In 1995, ex-Region X - covering all the northern part of Mindanao - was divided in two new regions: Region X for the western part and CARAGA (or Region XIII) for the eastern part.

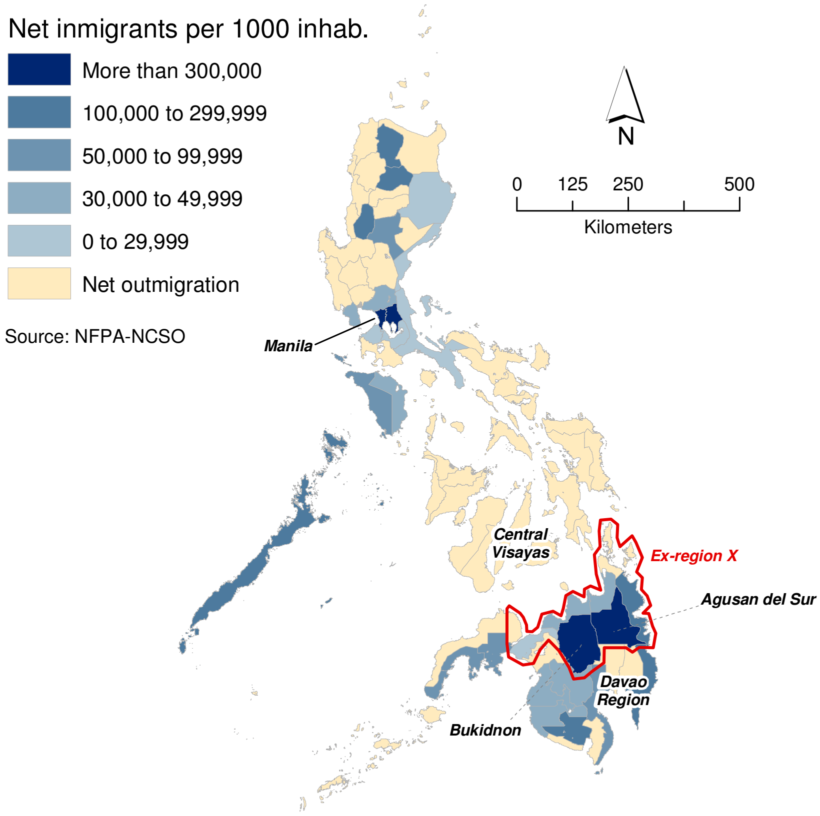


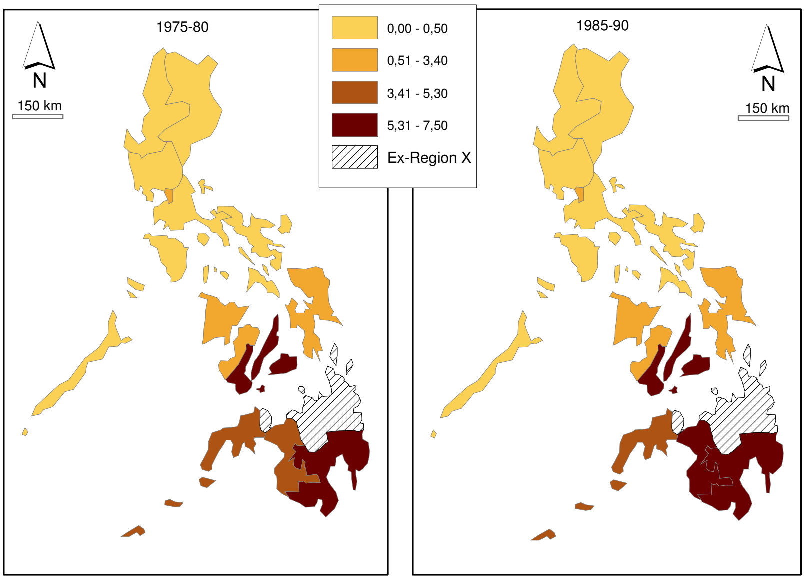
Fig. 4.8 – In-migration by province (1960-1970)

From 1975 to 1980 in ex-Region X, the out-migration rate was 24.6 ‰ while 32.9 ‰ for in-migration. From 1985 to 1990, those rates were respectively 26.3 ‰ and 27.2 ‰ (Jimenez and Sotto, 2004). 1975-1980 was a clear in-migration period while we observe a relative stabilisation between out-migration and in-migration ten years later. By crossing these rates with the population volumes, we get the following volumes of out-migrants and in-migrants (Table 4.2):

Ex-Region X (Reg.X + Reg.XIII)	*1975-80*	*1985-90*
Population	3,136,000	3,961,000
Out-migration rate (‰)	24.6	26.3
In-migration rate (‰)	32.9	27.2
Nb. of out-migrants	77,146	104,174
Nb. of in-migrants	103,174	107,739

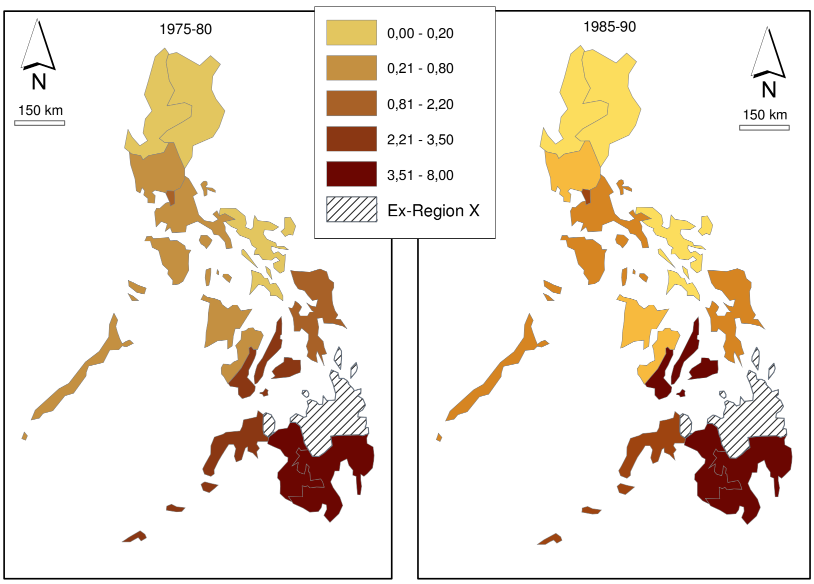
Table 4.2 – Population and migration rates

The in-migration volume has increased between the two periods like the out-migration volume but this latter flow is still lower than in-migration. Maps below show migration rates (estimated on the basis of the Yearbook of Labor Statistics in 2004 – *to* and *from* ex-Region X – observed between 1975-80 and 1985-90) (Fig. 4.9 and Fig. 4.10). According to map 4.9, it appears that regions that have provided more in-migrants to ex-Region X are the provinces of Mindanao, especially the regions XI (Central Mindanao) and XII (Southern Mindanao), and Region VII (Central Visayas). With regard to out-migrants from ex-Region X (Fig. 4.10), they went to other parts of Mindanao, to Region VII (Central Visayas) and to Manila (National Capital Region or NCR).



Maps based on figures from Jimenez and Sotto (2004)

Fig. 4.9 – In-migration rates to ex-Region X (per 1000 population)



Maps based on figures from Jimenez and Sotto (2004)

Fig. 4.10 – Out-migration rates from ex-Region X (per 1000 population)

The *attractiveness trend* of Northern Mindanao described above was observed by other authors. In her study, Cruz (1986) examines in particular interregional migration between 1975 and 1980 only to the uplands areas. According to the study, ex-Region X was the region that received the most migrants in uplands areas, more than 48,000 migrants. They come mainly from Region VII (14,000 or 30%) and the rest of Mindanao (migrants from Regions IX, XI and XII involving 20,000 migrants, or 41%). Flieger (1996) observed that in 1990, ex-Region X and in particular the province of Agusan del Sur remains very attractive – although the attractiveness of Metro Manila was higher – as shown in the map below (Fig. 4.11) (based on data from the Philippine population censuses of 1980 and 1990):

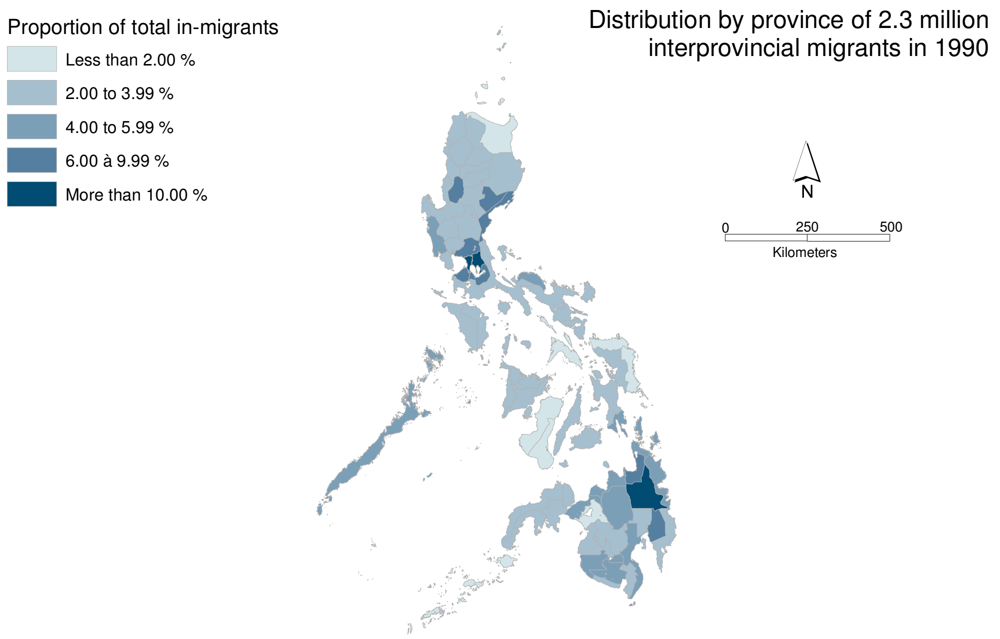


Fig. 4.11 – 2.3 million interprovincial migrants in 1990 by province (after Flieger, 1996)

Mindanao appears clearly to have been an attractive island – over 4 million people have migrated to Mindanao in the twentieth century – particularly in its northern part including Agusan del Sur and this, especially after the Second World War (although Manila and its suburbs have played an major role in the national migration trend pushed by the industrial development). With the development in the means of transportation and their democratization in particular, flows to Mindanao were amplified during this century. Within the island, the migration rates were very heterogeneous, some regions or provinces being more attractive than others for various reasons (land availability, insurgency, social relations, etc.). Today, Agusan del Sur seems undoubtedly to have been – and still by now – a very attractive province. We focus to establish, in the second part of this chapter, a picture of migrations within the province. Let me mention finally that Northern Mindanao is also historically linked to the Visayas since a large proportion of its population comes from this area.

4.4 In-migration trends within the province of Agusan del Sur

4.4.1 Background

The highlights in the history of Agusan Valley have been identified by Hontiveros. The background – presented hereafter and mostly based on one of his research notices (Hontiveros, 1988) – will be helpful to understand the driving factors of recent migrations. The historical migration patterns in Agusan Valley since 19th century are presented in figure 4.12. A location map is given at figure 4.13.

Before the 20th century

Until 40 years ago, the Agusan valley was a vast jungle with inaccessible swamp surrounded by rough mountains. The natural conditions in this valley, a vast watershed, have forced early settlement to locate along the rivers. In pre-Hispanic era, the old tribal communities from Butuan had significant trade relations with the kingdoms of Asia. National Museum's archaeological teams have unearthed more evidence of these relationships including *balanghai*, large wooden boats, which are undoubtedly the most convincing evidence. A series of pottery of ancient kingdoms in Asia (China, Thailand, Cambodia, Vietnam, Malaysia and Indonesia) as well as many gold objects that reflect that the region of Butuan was one of the most developed before the arrival of Spanish colonists. During the Spanish era, the primary forest of Agusan Valley was not affected. The missionaries recorded at the time a few villages along the Agusan River, and along the Mainit Lake and the coast: Butuan, Talacogon, Bunawan, Tubay and Jabonga. The first significant movement of population was recorded only at the end of the period of Spanish colonization during the 1880s when the Jesuits established many *reducciones* near the confluence of rivers with the Agusan River. The *reducciones* were concentrations of native communities in places more accessible providing better contacts with missionaries and Spanish Crown's officials. These *reducciones* constitute the nuclei of future current towns: Cabadbaran (at the mouth of the river Cabadbaran), Las Nieves (Agusan river), Esperanza (at the confluence of rivers Agusan-Wawa-Ojota-Hawilian), San Luis (Agusan-Casilayan), La Paz (Agusan-Adgawan), Loreto (Agusan-Umayam), and Veruela. But the reducciones barely shifted the tribal economy from the immemorial hunting-and-gathering stage into settled agriculture. These have, however, aided immensely in Catholic proselytizing efforts and served as a basis for townships. The reductions had a spotty record: the rigors of opening virgin lands and the discipline of settled agricultural life, combined with stern alien control and cultural influence, proved too much for the natives, and this explains the series of failures experienced earlier by the Recollects (Spanish colonists). Soon, the Spanish crown lost its grip on the islands and the colonial sovereignty was assumed by the Americans. The revolutionaries, led among others by Gumersindo Flores and Andres Atega, resisted the American entry. But it did not take long for the American proconsuls to have a grip on the situation. If there is one lesson to be drawn at this stage, it is that the Agusan valley does not have a feudal tradition similar to the haciendas of Luzon and the Visayas.

The American colonial period
A rare example of accumulation of land at the turn of the century was that of Don Andres Atega y Garcia, a Spanish mestizo. Atega, by various means (direct occupation, purchase or reportedly some devious means of getting lands from the natives) managed to acquire more than 3,000 hectares of arable land. Much of this land became farms, coconut, cattle ranches and rice and corn fields. Atega's method of land acquisition was a foretaste of things to come. Don Andres Atega has somehow, introduced the beginnings of a feudal system. Indeed, in-migrants had to deal with local tribes. In addition, of course, to the acquisition by honest means of vacant land which were numerous in the first half of this century, the land was also acquired through methods such as outright purchase, barter, trickery and intimidation. Early in the American period - between 1910 and 1920 - *homesteads* were introduced and extant land deeds dating back to those years showed that these landholdings radiated from Butuan towards Buenavista in the west and Cabadbaran in the east. Land-hungry settlers from the Visayas began to trickle into the wilds of northern Agusan. This movement accelerated in the thirties with the bigger influx of migrants: Boholanos, Cebuanos, Ilonggos, Leyteños and a sprinkling of lIocanos. In those years when money had barely begun to be the prime medium of exchange, many poor people did not hesitate to get rid of part of their land to pay, for example, costs of hospitalization. The pre-war years saw the proliferation of landholdings in Butuan and other coastal towns in what is now known as Agusan del Norte. Cultural clash, outright land grabbing and misunderstandings arising from land purchases attended some of the acquisitions, mainly between settlers and natives. Some lands were acquired for a box of sardines, a gun or a garment. These practices were no guarantee for social peace, however. The natives viewed land as communal and ancestral; many settlers took the modem concept of a permanent, exclusive and absolute right of ownership. Not being used to the changing situation, tribal communities moved to the hinterlands. This trend continued in the post-war years. Farming in the pre-war years were concentrated on food crops – rice, corn, bananas, vegetables, root crops. As a commercial crop, coconut was the exclusive choice

The post-war period

The post-war period saw the acceleration of migration at a rate much higher than what has already been experienced in the Agusan valley. The influx also meant that population movement was not restricted anymore in the coastal towns, but more and more the thrust was towards the interior. More than any other factor, it was the boom in the lumber industry that accounted for this. The post-war years were a period of economic expansion. Settlers followed in the wake loggers as fast as trees were cut. This was not beneficial to the existing delicate ecological balance but for migrants seeking to exploit the significant valley's farming potentials, the impenetrable wilds of the Agusan Valley were finally tamed. By 1960, the Agusan-Davao Road (now a section of the Pan-Philippine Highway) was built, providing strategic access to the Mindanao's North-East interior. New towns were built along the highway artery: Bayugan, Prosperidad, San Francisco, Bunawan, Trento and later Sibagat and Rosario. The population and economic activity were again shifting. From a network of small towns relatively sedentary structured by rivers (*sedentary river-towns*), came a new network structured by the highway (*dynamic highway towns*) east of the Agusan River. A dramatic example of this shift is the fate of two neighbouring municipalities, Esperanza and Bayugan. Up until 1960, the old river-town of Esperanza was the largest town in Agusan del Sur, with a population of 31,825. Bayugan, which was then a remote village about ten kilometres from the Agusan River, is not even in the population censuses. But in ten years time, with the construction of the new Agusan-Davao road inviting more settlers to its virgin lands, Bayugan registered a population of 37,816. Esperanza's population went down to 21,057. 1974 was the final year for tile uninterrupted boom in the wood-based industry, and from this point on it was a downhill slide Martial' law was declared more than a year before. The country as a whole experienced a series of economic recessions related to the sharp rise in oil prices, which affected all sectors, including timber sector. In the eighties the agro-forestry projects became popular and large plantations (*albizzia falcata* and rubber trees) were planted in the region. This movement was followed by small owners thanks to the long-term credit from Development Bank of the Philippines (DBP). As the period of martial law lengthened, repression increased. There was also an upsurge of insurgency, particularly exacerbated in the Agusan valley because of the military abuses and the consequent human rights violations, and the land problem. Thus, the decade of the eighties showed a historical break in the agrarian situation of Agusan valley with the entry of large-scale plantations. Proceeding from this emerging trend, there is a shift in principal economic activity from a resource-based extractive industry to intensive agricultural enterprises.

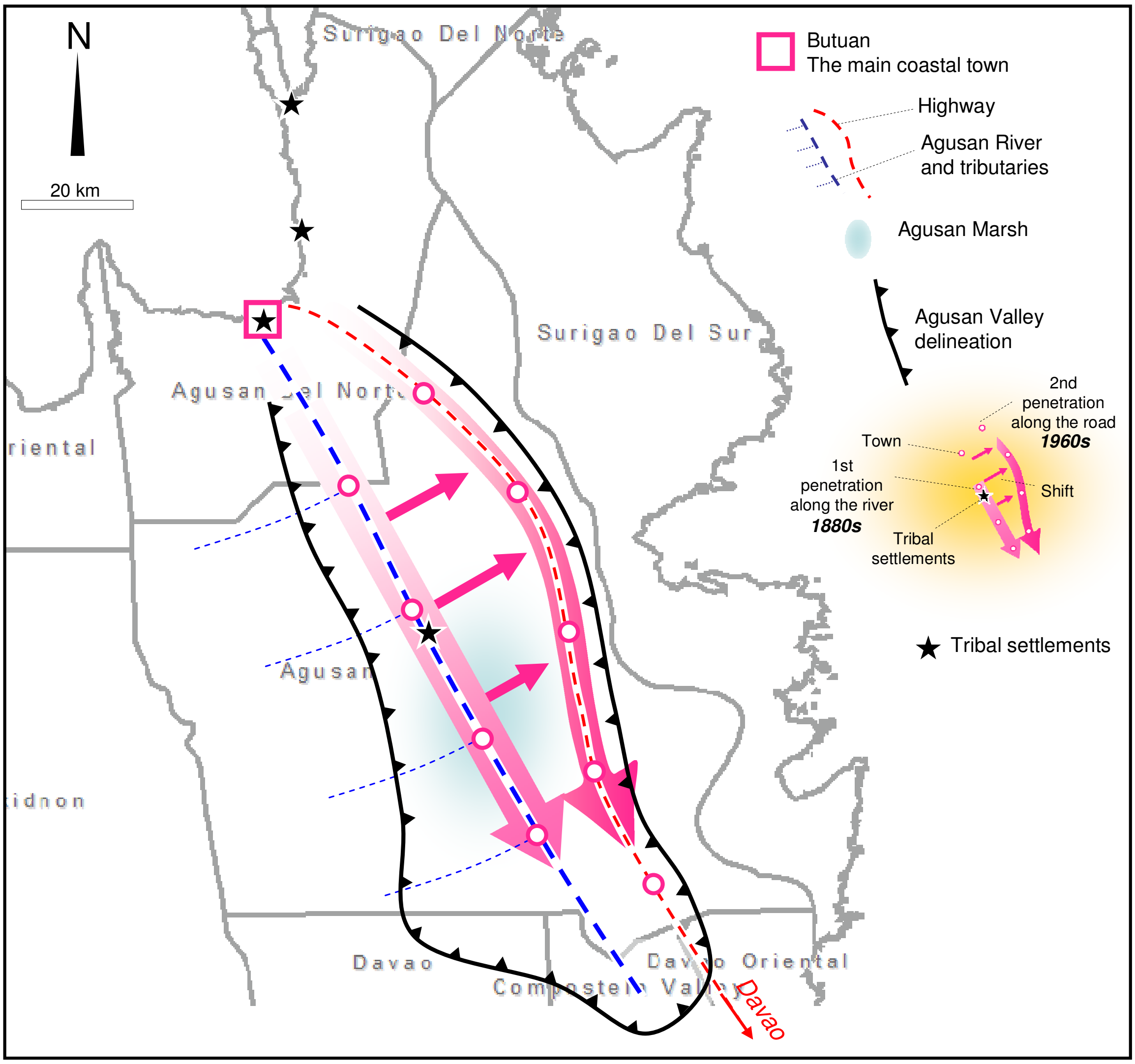


Fig. 4.12 – Migration historical flows in Agusan Valley

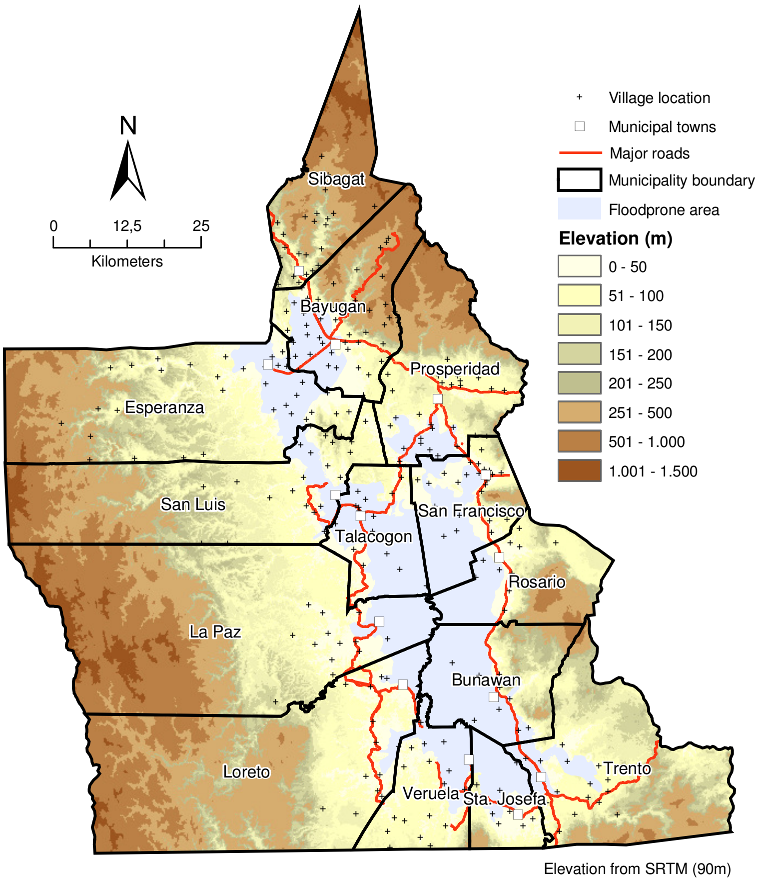


Fig. 4.13 – Agusan del Sur, municipalities and land use

4.4.2 Migration at the provincial level (since 1960)

From about 38,000 people in 1948, the population of the province of Agusan del Sur rose to 609,000 in 2007. Graph below shows the demographic evolution at provincial level in CARAGA Region (Fig. 4.14). Agusan del Sur encountered a very important growth during the last decades.

Agusan population growth rate[38] is significantly higher than national rate and the sharp population increase cannot be only attributed to natural growth, but also to high levels

[38] Population Growth Rate (PGR) is expressed as a percentage of the number of individuals in the population at the beginning of that period. This can be written as the formula:

$$PGR = \frac{(\text{Population at end of period - Population at beginning of period})}{\text{Population at beginning of period}}$$

of migration. This demonstrates the important attractiveness of Agusan del Sur especially during the period 1948-1970 and during the period 1980-1990 as illustrated in the graph hereafter (Fig. 4.15). Orlina and Recio (1978) indicate that 29,116 people arrived in Agusan del Sur during the sixties.

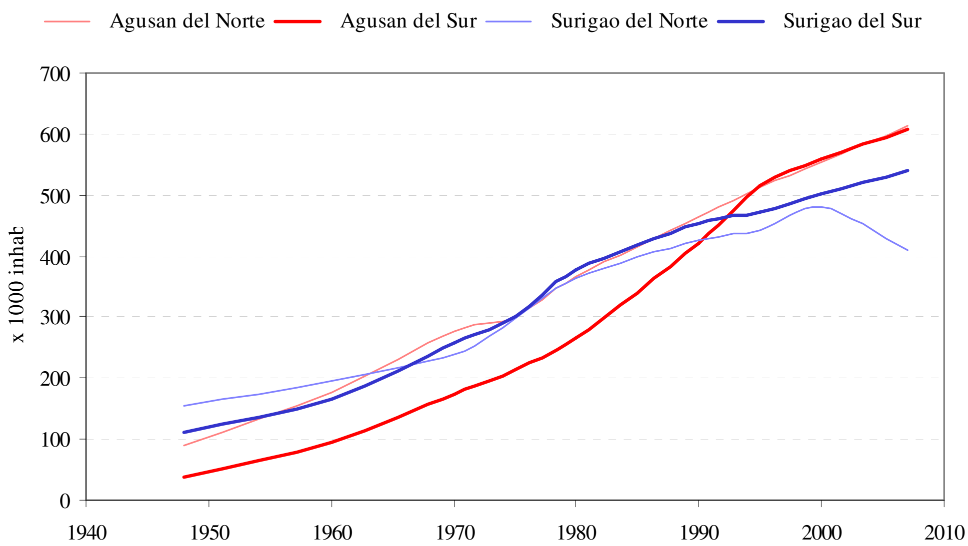


Fig. 4.14 – Total Population by province (CARAGA - Region XIII) 1948-2007 (Source: NSO)

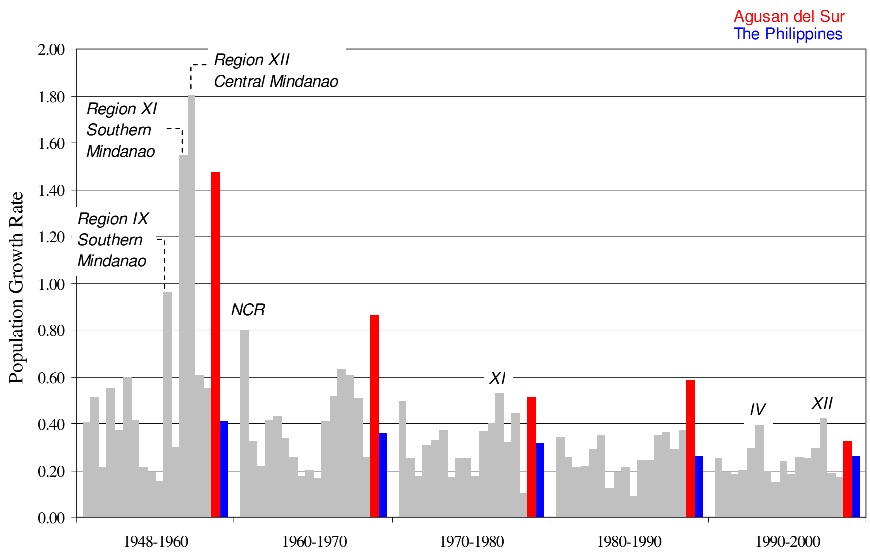


Fig. 4.15 – Population Growth Rate by region

The 1948-1960 PGR of Agusan del Sur is 1.47 – one of the largest of the country – while the national PGR during the same period is 0.41 (own calculation based on *Bureau of Labor and Employment Statistics* data).

As there are very few studies about migration at the provincial scale, it is necessary to approximate in-migration amount on the basis of Crude Rate of Natural Increase (CRNI). Provincial CRNI has been calculated for 1990 (23.6 ‰) and 1995 (16.7 ‰), based on data from NSO (National Statistics Office) and from BLES (Bureau of Labor Statistics and the Employment) (Table 4.3).

	1990	1995	2000
Births [a]	11,050	9,781	9,532
Deaths [a]	1,123	1,163	1,085
Population [b]	421,000	515,000	559,294
CBR	26.2	19	17
CDR	2.7	2.3	1.9
CRNI	23.6	16.7	15.2

[a] NSO (Vital Statistics Division)

[b] Bureau of Labor and Employment Statistics

Table 4.3 – Provincial Crude Rate of Natural Increase (1990, 1995 and 2000)

By applying the CRNI in 1990 for the period 1990-95 and CRNI in 1995 for the period 1995-2000 we obtain the estimated *natural population* in 2000 (P_{nat}^{2000}), in other words the population resulting of a natural increase. It is possible to estimate the number of in-migrants during the nineties by subtracting the *natural population* in 2000 (P_{nat}^{2000}) from the *effective population* in 2000 (P_{eff}^{2000}). As a result, the volume of in-migrants during the nineties ($\mathrm{Im}^{90\text{'s}}$) can be estimated to about 45,000 (Table 4.4). This value is given by the following formula:

$$\mathrm{Im}^{90's} = P_{eff}^{2000} - P_{nat}^{2000} \tag{4.1}$$

Population	P_{eff}	CRNI	P_{nat}	Im^{2000}
1990	421,000			
1991		23.6 ‰	430,936	
1992		23.6 ‰	441,106	
1993		23.6 ‰	451,516	
1994		23.6 ‰	462,172	
1995		23.6 ‰	473,079	
1996		16.7 ‰	480,979	
1997		16.7 ‰	489,012	
1998		16.7 ‰	497,178	
1999		16.7 ‰	505,481	
2000	559,000		513,922	45,078

Table 4.4 – Estimated volume of in-migrants to ADS during the nineties

4.4.3 Sub-provincial migration distribution

Where are these thousands of in-migrants located and in what places are they settled? Did they give priority to the highway, the economical artery, or areas with available lands? The objective of the present section is to answer such questions.

The assessment of migratory pressures/volumes within the province of Agusan del Sur is difficult because there is no data on internal migration at the sub-provincial level. A fortiori, there is no time series data. Few authors have conducted studies on internal migration in the Philippines or in Mindanao, but not at a sub-provincial level due to the lack of data (see, for example Flieger (1996) and Orbeta and Pernia (1999)).

4.4.3.1 Qualitative data

Several sources of data exist to address these issues. The *Comprehensive Land Use Plan* (CLUP), as municipal planning documents (including maps, statistics and texts), provides some information on the demography, on historical events that have influenced the preferred destinations for in-migrants. Similarly, the *Barangay Development Plans* (BDP), when existing, are often able to provide information. This is the qualitative data that can help us to assess the in-migration events at sub-provincial level.

4.4.3.2 Quantitative data

a. Population by ethnicity
The 2000 population census lists, by municipality, the origins of migrants, or more precisely the ethnicity of people. 69 % of ADS in-migrants come from outside Mindanao (with 67.1 % from the Visayas). The remaining 30 % come from other provinces of Mindanao (Table 4.5). The map of these data at the municipal level (Fig. 4.16) shows that migrants from the Visayas are mainly located in the municipalities of Buyugan, Prosperidad and San Francisco while the Manobos (see box 7 - Indigenous People (IPs)) are primarily located in the municipalities in the south-west (resp. La Paz and Loreto) and represent the dominant ethnic group (Manobos representing respectively 63% and 43% of the municipal population). This confirms, on the one hand the attractiveness of towns along the highway for the in-migrants and, on the other hand, the (forced or not) isolation of Manobo’s indigenous ethnicities.

Ethnicity	Origin Region	Population	%
	VISAYAS	**374,803**	**67.12%**
Cebuano	Central Visayas (VII)	171,276	30.67%
Bisaya/Binisaya	All Visayas (VI, VII, VIII)	101,321	18.14%
Hiligaynon, Ilonggo	Western Visayas (VI)	50,707	9.08%
Boholano	Central Visayas (VII)	39,765	7.12%
Waray	Eastern Visayas (VIII)	8,882	1.59%
Karay-a	All Visayas (VI, VII, VIII)	2,852	0.51%
	ILOCOS AND CALABARZON	**10,947**	**1.96%**
Ilocano	Ilocos (I)	9,848	1.76%
Tagalog	Calabarzon (IV-A)	1,099	0.20%
OUTSIDE MINDANAO		*385,750*	*69.08%*
	CARAGA	**61,854**	**11.08%**
Butuanon	CARAGA (XIII)	23,865	4.27%
Surigaonon	CARAGA (XIII)	13,535	2.42%
Kamayo	CARAGA (XIII)	12,223	2.19%
Higaonon	Northern Mindanao (X) and CARAGA (XIII)	8,024	1.44%
Banwaon	Northern Mindanao (X) and CARAGA (XIII)	4,207	0.75%
	MINDANAO (outside CARAGA)	**4,302**	**0.77%**
Davaweo	Davao Region (XI)	2,011	0.36%
Dibabawon	Davao Region (XI)	1,290	0.23%
Maranao	ARMM	1,001	0.18%
Manobo/Ata-Manobo	Mindanao	**87,543**	**15.68%**
Other	**-**	**18,965**	**3.40%**
TOTAL		**558,414**	**100.00%**

Table 4.5 – Population by ethnicity within ADS (Regions from Mindanao are underlined. Source: Population Census, 2000)

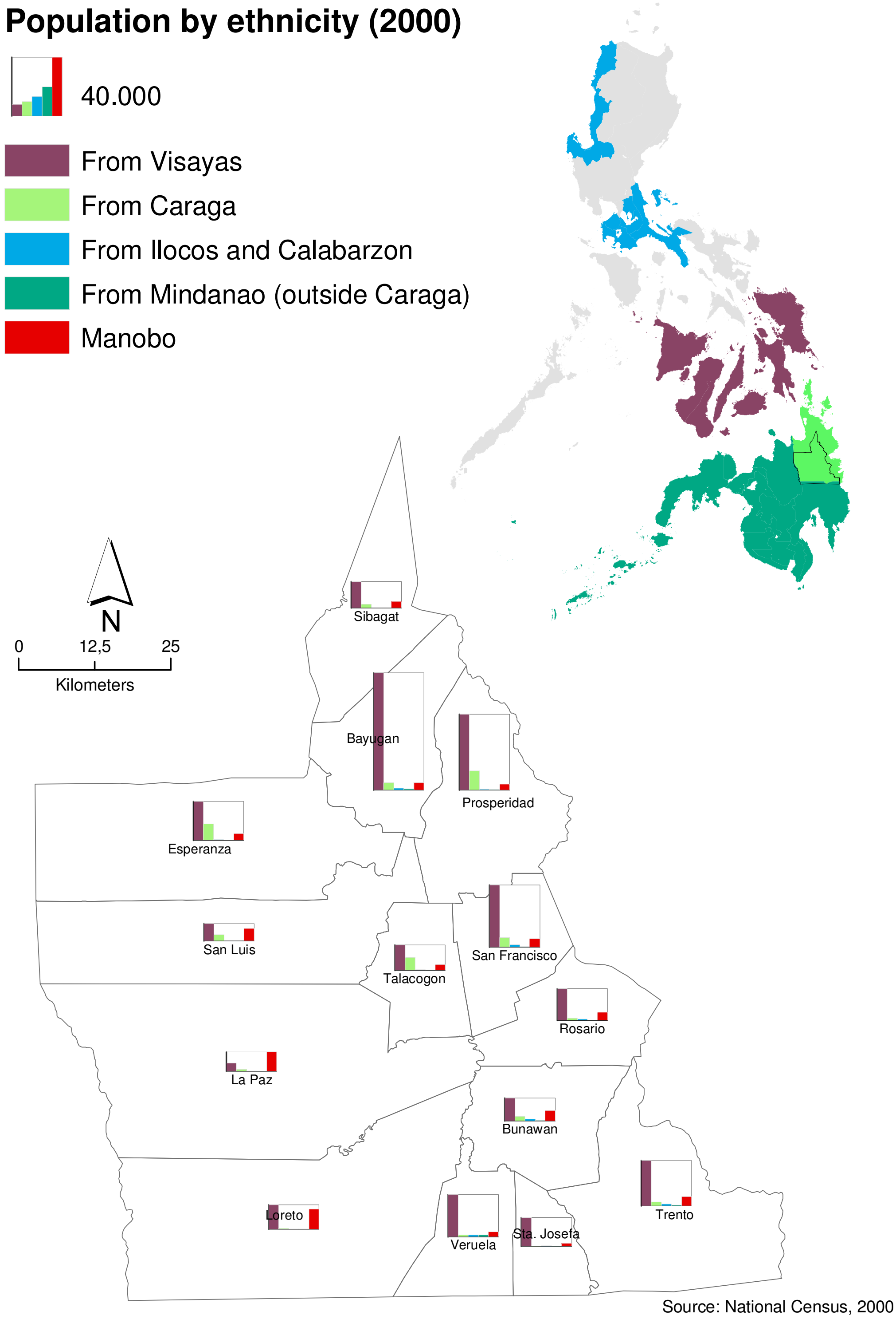


Fig. 4.16 – Population by ethnicity by municipality in Agusan del Sur

Box 7 – Indigenous Peoples (IPs)

What are indigenous peoples? Though widely used in international texts, this term has never been formally and precisely defined. Indigenous peoples are the original inhabitants of many countries. The definition most generally used, including by the United Nations, is *indigenous communities, peoples and nations are those which having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of societies now prevailing in those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop, and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal systems* (Martinez-Cobo, 1986).

In the Philippines, Indigenous Peoples' Rights Act (IPRA, 1997) defines IPs as a *group of people or homogeneous societies identified by self-ascription and ascription by others, who have continually lived as organized communities on community bounded and defined territory, and who have, under claims of ownership since time immemorial, occupied, possessed and utilized such territories, sharing common bonds of language, customs, traditions, and other distinctive cultural traits, or who have, through resistance to political, social, and cultural inroads of colonization, non-indigenous religions and cultures, become historically differentiated from the majority of Filipinos.*

b. Estimation based on the proportion of Indigenous People (IPs)

In 2005, an extensive survey at the *purok* scale was conducted all over the Philippines. The survey, entitled *Community-Based Monitoring System* (CBMS) includes a variety of indicators covering several topics: health, nutrition, housing, water and sanitation, education and literacy, income, employment, etc. It was conducted by sampling. After several aggregations, spatial data are available today, as the case, at the purok, barangay and/or municipal levels. The proportion of Indigenous People (IPs) within the population is one of the indicators registered in the CBMS database[39]. This indicator, available for each barangay in the province of Agusan del Sur, can be seen as a *proxy variable* of in-migration. Indeed, we may consider that a place characterized by a high rate of IPs is a place with few in-migrants. Assuming that every not-IP is a

[39] By crossing the proportion of IPs with population values (CBMS, 2005), the number of Indigenous People in Agusan del Sur is assessed to 128,000 representing about 41% of total provincial population (314,000 inhabitants). ADB (2008) gives some information about the evolution of the proportion of IPs during past decades. The Master Plan rapport mentions that "ethnic diversification in [Agusan] Bassin turned IPs from a majority to a minority in less than 50 years" (ADB, 2008, p.3-19).

migrant, we may consider that the number of in-migrants in a given barangay is given by the following:

$$\text{Im} = P_{tot}(1 - r_{IP}) \tag{4.2}$$

where P_{tot} is the total population of the barangay and r_{IP} is the proportion of IPs.

The r_{IP} indicator gives little information because it is a relative statistics (percentage). The index Im, representing the effective and not only the rate, has been mapped at the barangay level (Fig. 4.17), as well as at the municipal level (Fig. 4.18) for comparison reasons (see hereafter).

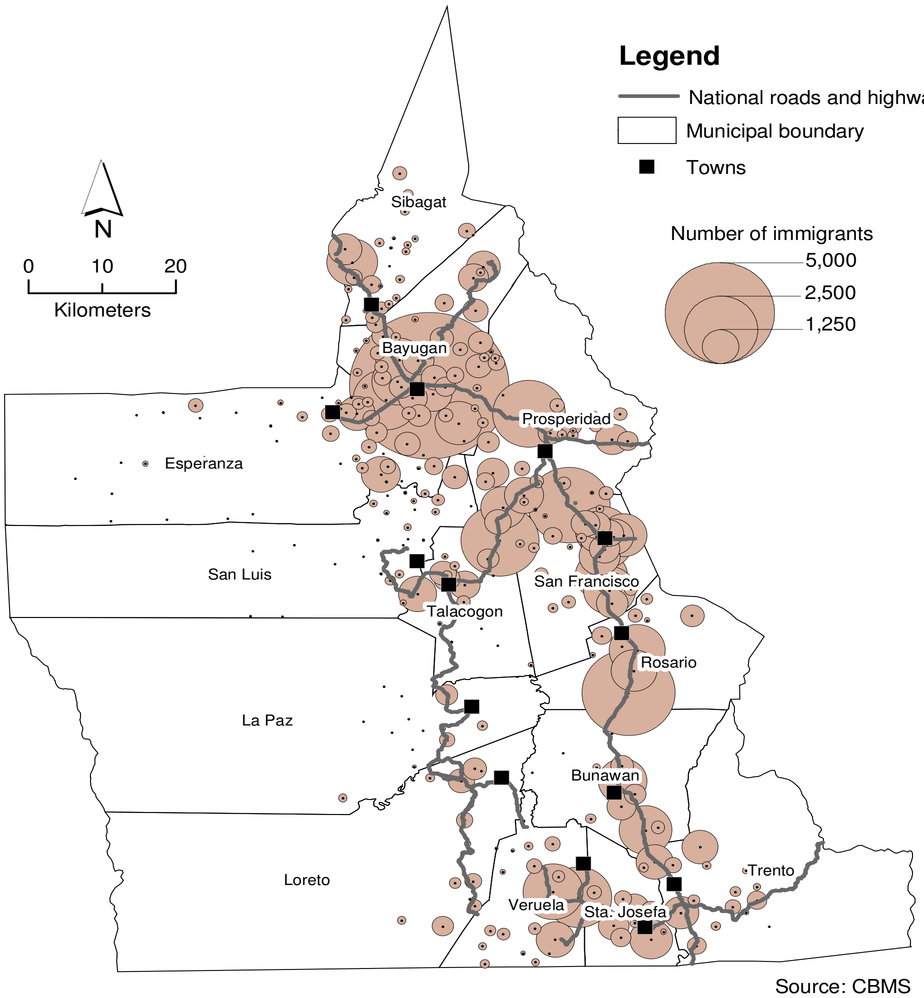


Fig. 4.17 – Estimation of the number of in-migrants by barangay in ADS, 2005

The map above clearly shows that urban areas (Bayugan, Prosperidad and San Francisco) and some areas located along the highway have in 2005 a larger number of in-migrants than the areas localized to the west. Several factors may explain this spatial heterogeneity. The topography of the province (marshes surrounded by mountains), the characteristics of vegetation cover (impenetrable in some places), the level of infrastructure, the land availability, the accessibility to services or market ... were such that some sites were unattractive. Areas having today a large number of in-migrants are areas that were attractive (in the past at least). The attractiveness of rural towns appears to have played a significant role in the heterogeneity observed. Similarly, some rural zones have also attracted many migrants.

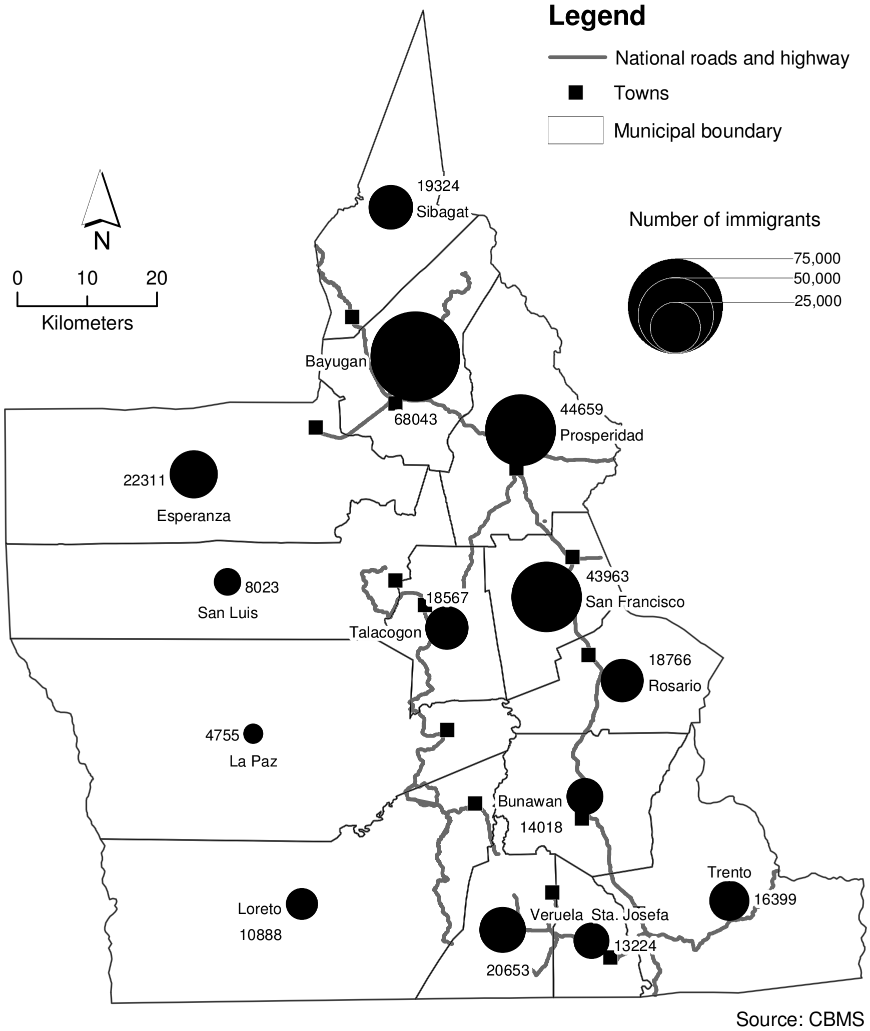


Fig. 4.18 – Estimation of the number of in-migrants by municipality in ADS, 2005

c. Estimation based on natural increase
Complementary data from National Statistics Office (NSO) have been used to assess the number of in-migrants per municipality in order to confirm or deny the previously obtained figures. Indeed through the comparison between the population observed at time *t* and its expected value – in this case a linear projection – at the same time, the volume of in-migrants may also be assessed. We have compared, for each municipality, the number of people observed in 2007 (P_{2007}^{obs}) with the 1970[40] extrapolated value in 2007 (P_{2007}^{ext}) based on national Crude Rate of Natural Increase[41] (i) observed in 1970 (27.5 ‰ after NSO) (Fig. 4.12). Formally we have:

$$P_{2007}^{ext} = P_{1970}^{obs} \cdot (1+i)^{(2007-1970)} \qquad (4.3)$$

If P_{2007}^{obs} is higher than P_{2007}^{ext} we consider that it is due to in-migration. If P_{2007}^{obs} is lower than P_{2007}^{ext} we consider that it is due to out-migration. Number of in-migrants and out-migrants in 2007 since 1970 would be:

$$\begin{cases} \text{if } P_{2007}^{obs} - P_{2007}^{ext} > 0 & \text{then} \quad P_{2007}^{obs} - P_{2007}^{ext} = \text{number of immigrants} \\ \text{if } P_{2007}^{obs} - P_{2007}^{ext} < 0 & \text{then} \quad P_{2007}^{ext} - P_{2007}^{obs} = \text{number of emigrants} \end{cases} \qquad (4.4)$$

With this method, the number of in-migrants since 1970 is estimated to be about 122,000 and the number of out-migrants to be about 19,000. Effective and extrapolated provincial population is presented in figure 4.19. Let us notice that the extrapolation of municipal population of Sibagat has been not possible due to a lack of data. Indeed, Sibagat's population before 1990 is not available.

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[40] We choose 1970 because settlers came mainly in the last 40 to 50 years to Agusan region (Hontiveros, 1988; ADB, 2008).
[41] We use national rate because rates at lower level (regional, provincial or municipal) are unfortunately unavailable.

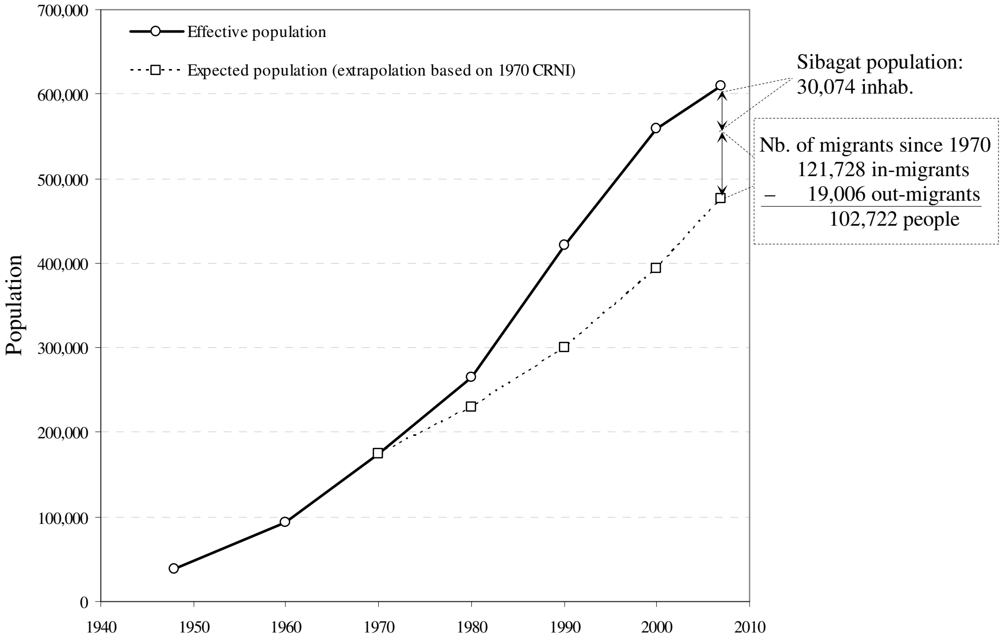

Fig. 4.19 – Effective and extrapolated provincial population (ADS)

The map below (Fig. 4.20) shows the estimation of in-migrants and out-migrants by municipality in ADS in 2007 according to (4.4).

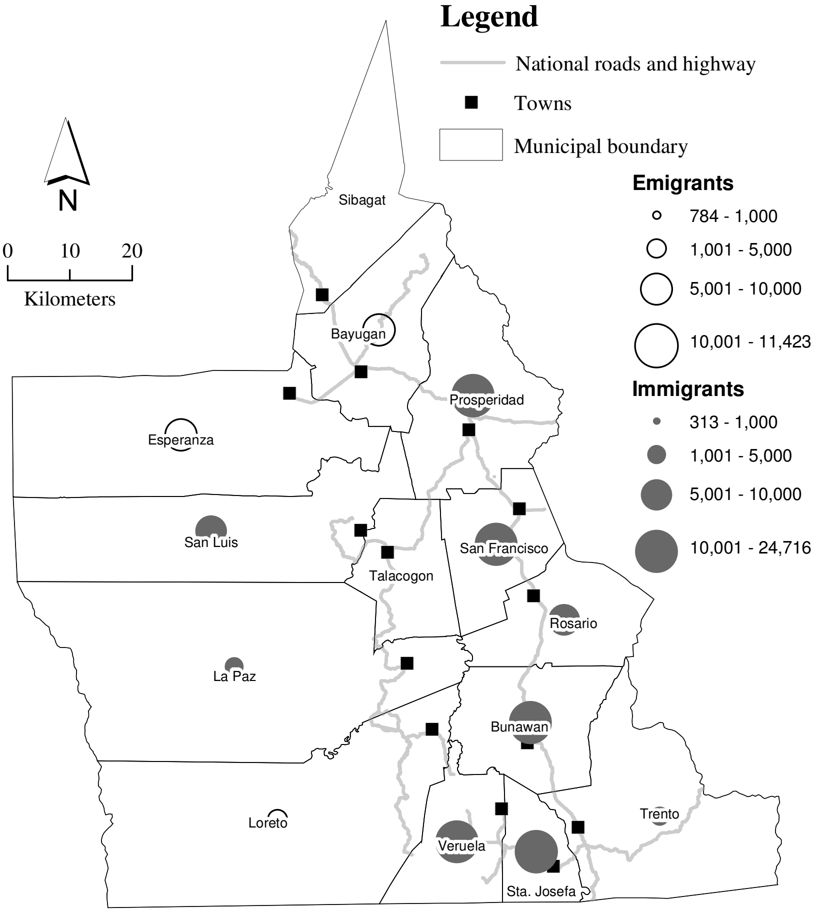

Fig. 4.20 – Estimation of the number of in-migrants and out-migrants by municipality in ADS, 2007

According to this latter figure it appears that in-migration involves all municipalities except Bayugan, Esperanza and Loreto which know out-migration.

4.4.3.3 Comparison of the two estimations

Table in annex 4 shows the estimated number of in-migrants by municipality with the two equations (4.2) and (4.4). It appears that about 122,000 in-migrants would enter in ADS since 1970 while estimation based on data from CBMS indicate that 307,000 people would immigrate to ADS. This difference can be explained by the fact that for this latter estimation we use a *proxy* (in-migrants are considered as "non-IPs") for which there is no time limit (people are considered as non-IPs if they are not living in the place since *time immemorial*).

4.5 Determinants of migration in Agusan del Sur

Classical determinants of migration observed from empirical studies have been mentioned in chapter 2. Firstly we present below some major determinants observed in the Philippines and in particular in Mindanao. Secondly outputs from two social surveys conducted by us in 2006 and 2008 give information about the determinants of in-migration[42] within the province of Agusan del Sur.

4.5.1 Determinants in the Philippines and in Mindanao

Pernia (1977) notices two relevant findings: (i) the expected income in the area of destination does not seem to have an influence on the choice to migrate while (ii) kinship ties at destination seem to be a decisive factor. Orlina and Recio (1978) in a major migration study focussed on the Philippines during the 1965-1973 period and had not identified the presence of arable land in Mindanao as a determinant of in-migration (pull factor)[43]. According to this study, the major findings about determinant of migration to Mindanao are the following:

1) The population density of each Mindanao province produces a negative effect on the in-migration rate. Provinces with high migration density usually have low in-migration rates, and vice-versa.
2) Most of migrants to Mindanao are males (except in Cotabato province) but the discrepancy between the two sexes is not very large.
3) Most of migrants to Mindanao belong to the working age groups.
4) The number of establishments, which approximates the level of industrialization of the Mindanao provinces, has a positive effect on internal migration rates. The more establishments a province has, the greater the number of migrants to that place.
5) The employment rate of the place of destination has a positive effect on the rate of internal migration. Provinces with higher rates of employment will obviously attract more migrants than those with low rates. Orlina and Recio (1978, p.61) even notice that "the employment rate variable seems to be the most influential factor affecting one's decision to migrate or not".

[42] As mentioned by Barbieri *et al.* (2008, p.293) in migration studies "the ideal analysis would draw upon data (…) in areas of both origin and destination". Their reflection was made about international migration but is true with internal migration. For practical reasons, we use here only data in area of destination while some information about origin was gathered through social surveys.

[43] Regression analysis performed by Orlina and Recio (1978) led the authors to conclude that "the presence of arable land in Mindanao does not prove to be an important factor in a migration choice" (Orlina and Recio, 1978, p. 61).

According to Ulack (1977) migrants came on Mindanao largely because the island offered significant agricultural potential. These migrants came mainly from the Visayas region where agricultural opportunities have decreased because of high densities and low agricultural farming conditions, including decreasing yields and soil fertility, emphasized by large population densities and weak farming technologies. Cebu and Bohol, two neighbouring islands of Mindanao, are probably the two islands that have experienced the most problems and this is reflected by the large number of Cebuanos and Boholanos living in Mindanao's rural areas (Vandermeer and Agaloos, 1967). Moreover, Cruz (1986), in a study about demographic pressures on upland areas in the Philippines, notices also that the urban and peri-urban populations migrate to rural areas due to various reasons such as: demographic pressure, increase of unemployment, proliferation of shantytowns and squatters, speculation (reduction of the access to cultivable areas), inadequate economic opportunities in industrial or services sectors, etc. In the same way, the existence of laws, such the Certificates of Land, which facilitate the access to the cultivable areas, can encourage to migrate towards rural areas.

Finally in addition to the agricultural potential that has attracted many migrants, two other major pull factors can be mentioned for Mindanao: the establishment of commercial companies such as (i) large-scale plantations (palm oil plantation and logging) and (ii) mining. The links between these activities and migration are developed later, in particular in chapter 6.

4.5.2 Determinants of migration to and within Agusan del Sur

Among the determinants of migration previously identified, it is coherent to ask ourselves which ones are verified today for Agusan del Sur. As the literature dedicated to this matter in Agusan del Sur is rather scanty, we conducted two field-based surveys in 2006 and 2008 to gather such information.

4.5.2.1 A scanty literature

Let us notice that even very few studies are dedicated to Agusan del Sur Province, a recent study identifies some determinants of in-migration to Agusan Valley: (i) the presence of relatives established in the province, (ii) the ease of finding a job and (iii) the ease in access to land. Indeed, land is relatively easy to obtain despite laws securing the land and rights of IPs (ADB, 2008).

Surveys in four communities at individual level whose procedures and results are presented below would also help to verify this.

4.5.2.2 Utility and objectives of our surveys

Many studies use mainly statistics (official or not) to identify the determinants of migration. However, some determinants can be identified from a source of information to the richness often overlooked: the knowledge and feelings of local people. Indeed, the search for other explanatory factors and the identification of the potential influence of migration on the level of marginality can be done only by the confrontation of a certain reality[44] observed *in situ*.

We conducted two survey campaigns in August 2006 and April 2008. The objectives of these surveys were (i) the identification of migration driving factors, (ii) the identification of links between activities, marginality and migration, (iii) the identification of possible differences between livelihood level of IPs and non-IPs, and (iv) the classification of expressed priorities among the population. Other information was gathered like the point of views, the feelings and the observed changes of the local population in their village[45].

4.5.2.3 Sites selection

The choice of surveyed villages was made following a preliminary field visit in January 2006. We visited a dozen of villages (with perceptible marginality levels and some migration flows in the past) with our local partner, ESSC (Environmental Science for Social Change), which is in close contact with the local populations. These villages are close to each other but are representative of a large number of villages in the province.

After this first selection, we focused on six villages/barangays (Fig. 4.21): Marfil (Sitio Latay) (Municipality of Rosario), Bayugan III (Municipality of Rosario), Barangay Aurora (Municipality of Sta-Josefa), San Andres (Municipality of Bunawan), Maligaya (Municipality of Rosario), Caimpugan (Municipality of San Fransisco). A brief description of each site follows (Table 4.6). After a field visit as well as discussion with key persons such as the barangay captain (political chief) and/or the *datu* (indigenous chief) and several discussions with ESSC's staff, four villages were selected: Caimpugan, Marfil, Bayugan III and Maligaya.

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[44] We talk about a *certain reality*, since no investigation can be perfectly objective. Even taking the usual precautions in order to get an optimal representation, several biases may occur (Tagalog-English translation, lack of interviewees, etc.).

[45] Initially, we had a particular interest on priorities of local people. Because the expressed priorities were substantially the same (more money, more fertilizer, less poverty ...) and because a recent study has covered this subject including on this area (ADB, 2008), we opt to neglect this part. This gathered information led us, however, to realize the magnitude of the phenomenon.

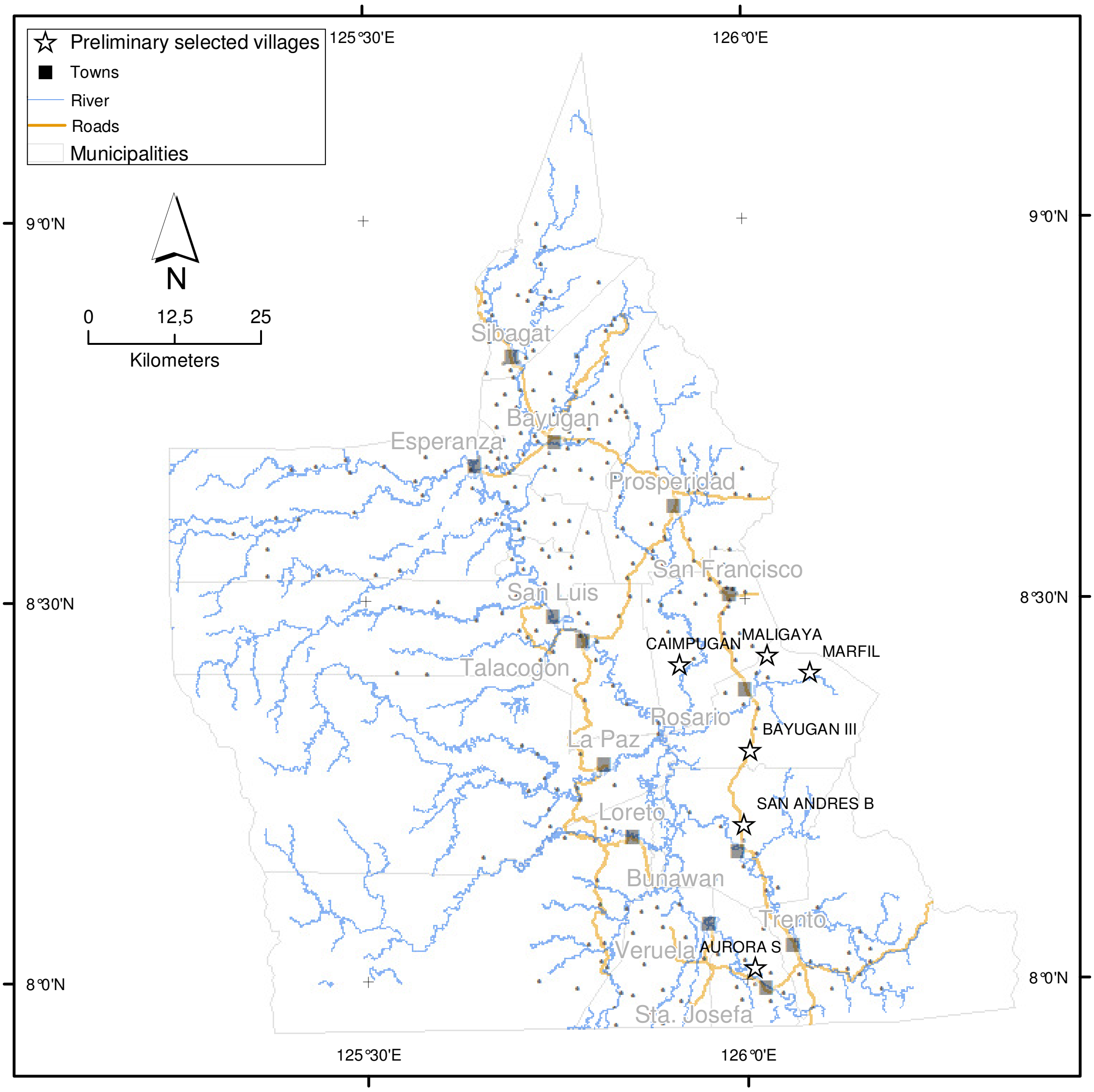

Fig. 4.21 – Six preliminary selected villages for survey

Marfil is located at about 17 kilometres, East of Rosario (travel time: 90 minutes). Marfil is composed of 7 puroks. The community of Marfil exploits mainly forest products like *falcata* tree or rattan. Barangay Marfil is located close to the CADC 153 (Certificates of Ancestral Domain Claim). *Some community members of sitio Latay (Marfil) and SFADS-ESSC staff January 2006*	
Bayugan III is located at about 10 kilometres South of Rosario along the highway. Bayugan III is composed of 11 puroks. The main activities are falcata logging, rattan and rice. A cooperative exists for the production of falcata. Barangay Bayugan III is located close to the CADC 153. *Falcata Logging – Bayugan III January 2006*	
The Barangay Aurora is located at about 3 kilometres North of Sta-Josefa. The land use is composed of Palm Oil Plantations, banana, rice and corn. A cooperative exists for the rice cultivation. *Clear Palm Plantation in Aurora Sta-Josefa, January 2006*	

San Andres is located at about 7 kilometres North of Bunawan. The community exploits/cultivates falcatta, rattan, rice and root crops. San Andres is close to a CBFM. Presence of a cooperative (for the production of falcata). *San Andres January 2006*	
Maligaya is located at about 5 kilometres East of Rosario. The main activities of the community are gold panning and oil palm production (cooperative). Maligaya is located close to the CADC 153. *Gold Panning in Maligaya, January 2006*	
Caimpugan is located close to the Agusan Marsh at about 15 kilometres South-West of San Fransisco. Caimpugan is composed of 7 puroks. The community grows rice and catches fishes. *Caimpugan January 2006*	

Table 4.6 – Description of preselected villages in January 2006

A document summarizing the variables for the selection of the six potential sites (accessibility, population, facilities, land use, existing management plans, and financial support) built with the collaboration of ESSC during our first field trip in January 2006 is presented in annex 5.

Only four villages were kept for the survey among the six potential sites. Two of the sites (San Andres and Aurora) do not seem to be adequate because their organization systems (dominant cooperatives) are not representative of the way of life of Agusan del Sur communities. Background and demographic tendencies of each village are presented hereafter.

4.5.2.4 Sites Background

We produce below a brief presentation of the background and the main activities observed in the four surveyed villages. A summary is presented in table 4.7.

a. Bayugan III
Bayugan III is located at about 10 kilometres South of Rosario along the highway. Bayugan III is composed of 11 puroks. The main activities are falcata logging, rattan and rice. A cooperative exists for the production of falcata.

b. Caimpugan
Barangay Caimpugan was founded in 1886 and derives its name from the families of the local natives (Lumads). In 1940, Caimpugan belonged to the municipality of Talacogon. Then in the sixties, the village entered the route of the new municipality of San Francisco. During that same decade, a major flood destroyed a large part of the village and the community knew for several months' starvation and a lot of people were suffering from diarrhea. In the eighties, the first rebel groups entered the territory of Caimpugan, sometimes forcing people to leave the village. Despite this, the territory of Caimpugan attracted more and more migrants from other provinces of the country, attracted by jobs generated by the logging operations. In 1992, small projects were born in the village such as the installation of a rice mill in Purok 5 (private funding) and the establishment of a water pump (jetmatic pump) in Purok 1. Later, a primary school was established (BDAC, 2003).

c. Maligaya
Barangay Maligaya is one of the six barangays covered by the Ancestral Domain claim of the Manobo Tribe of Rosario under CADC 153. It was originality known as Sitio Limbatangan under the political jurisdiction of Bgy. Cabantao before it became a regular barangay in 1979 in reference to the Limbatanagn River that traverses the sitio. This river originates from the Bubungan to Makapunpun of Mont Makapunpun and serves as one of the major tributaries of Solibao River in the eastern portion that empties into the Agusan River system. Geographically, Bgy. Mati of San Francisco claimed also Sitio Limbatangan as part of its political jurisdiction before. At present the residents of the barangay and nearby communities utilize the Limbatangan River not only for fishing but also for gold panning activites. It is one of the main sources of cash, especially of the Manobo community members in order to augment their meager income. Since then, Limbattangan is already known to be rich in terms of gold deposit. The settlement in the barangay at present is concentrated within the areas covered by the Filipinas Palm Oil Plantation Inc. (FPPI) specifically near the junction of Limbatangan and Manangahon Rivers. Geographically in terms of its political coverage and area of jurisdiction, the entire barangay straddled between the FPPI and

the Forest Plantation of PICOP Resources Incorporated (PRI) as part of their existing tenure the Integrated Forest Management Agreement No. 35 (IFMA No. 35). The Manobo and migrant as settlers are concentrated where the FPPI companies also establish the housing unit for their staff. However, in comparison with the migrants the Manobo are concentrated in purok outside the housing unit of the company while most of the migrants occupied the housing unit provided by the company.

The first known settlers of the barangay were all Manobo families. Their settlement in the area dated back before or early 1900s. The opening of the Oil Palm Plantation in early 1980s through the National Gurthrie Plantation Incorporated (NGPI) spurred the increased of population in the barangay, particularly the migrants who seek for economic opportunity and spawned by the entry of oil palm plantation through direct and indirect employment. Most of those employed in the oil palm company are migrants rather than the Manobo. This also explains why most of the migrants own most of the economically well off Sari-sari store in the area and why the housing units provided by the company are occupied by migrants. Migration was further aggravated when the NGPI transferred their plantation office in Bgy. Maligaya in 1985.

d. Marfil

Mabtay was the fist name of the barangay wherein only few native families were residing. This name was taken from the world “nangamatay”. The creek where the natives get their source of water dries up during dry season, and most of the fishes on that creek die (mangamatay) when it dries up. The first inhabitants were composed of about ten families. According to Barangay development Plan of Marfil, the first in-migrants were composed of seven families (about in 1958). In 1963, the PICOP[46] logging operation started and constituted the main source of income of the residents. At this time, Marfil was a vast virgin forest. Cutting of tree was an advantage to the residents because it gives them bigger area to cultivate their land. PICOP constructed roads within Marfil and its adjacent barangays up to Bislig, Surigao del Sur. Because of this, the residents already go to Managagy for purchasing. Before when there were still no constructed roads, the residents go to Rosario to purchase where they just follow foot trails along the Solibao River. The road construction made the transportation easier. PICOP did not limit their program on logging operation, it also have livelihood programs like Agro-Forestry Program and Social Forestry Program. When the logging operation boomed, the residents left out farming. By the time the operation slowed down, the residents had hard time looking for income because their farms do not have products. During the eighties, Marfil experienced several insurgency events (conflicts between NPA and Philippine Army).

[46] Paper Industries Corporation of the Philippines

	Municipality	*Main activity*
Bayugan III	Rosario	Small-tree farming
Caimpugan	San Francisco	Farming, fishing
Maligaya	Rosario	Palm Oil Plantation
Marfil	Rosario	Logging

Table 4.7 – Main activities in the four surveyed villages

4.5.2.5 Evolution of the population

Evolution of population size from 1990 to 2007 in each barangay is presented below (Fig. 4.22). During this period, two barangays show a significant population growth: Caimpugan and Bayugan III. In 17 years, the population in Caimpugan more than doubled (from 507 in 1990 to 1,616 in 2007). For Bayugan III, the population rose from 4,943 inhabitants to 8,360 in the same period. A decrease in population was experienced in Maligaya while no significant evolution is observed in Marfil.

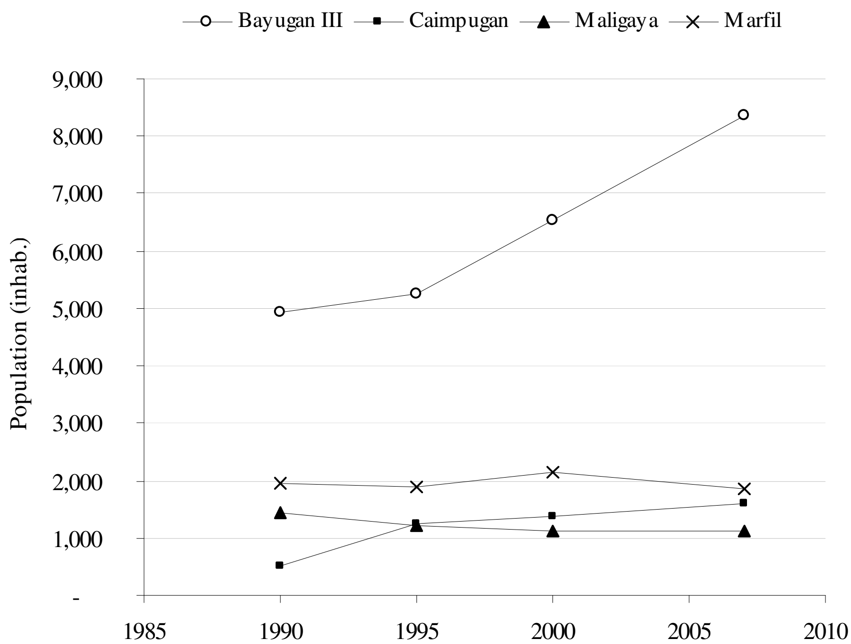

Fig. 4.22 – Evolution of the population
in the surveyed villages (1990-2007) (source: NSO)

4.5.2.6 Survey methodology

Two types of surveys were performed. The first was a questionnaire with short answer, i.e. that the interviewee had to answer mainly to multiple-choice questions. Each interview lasted approximately 20 minutes per individual. We also proceeded to a few sessions of grouped interviews. The second type of investigation was more a discussion, the questions being open. These discussions – in Tagalog - with key people (including *barangay captain* and *datu*) were recorded on tape or on video. The translation and synthesis was done later by an interpreter from ESSC. In total, approximately 150 questionnaires were completed and more than thirty reports discussion were written. The questionnaires consisted of several parts, each addressing a specific issue (household composition, type of activity, tenure, migration, facilities, communication, priorities and changes). An example of questionnaire is presented in annex 6. Although we tried to get on the field a representative sample of the population of each surveyed village the reader should be aware however that the statistical standards require traditionally are not fully met here. We have used a *nonprobability sampling* mixing *convenience sampling*[47] and *purposive sample*[48] (Anderson *et al.*, 2003). However in our case, we have tried to use a near *stratified random sampling approach*, in which the population was divided into subpopulations (strata based on gender (male/female) and the migration status (migrants/indigenous)) and random samples were then drawn from each of these strata. Effectives in each stratum for the four surveyed villages are presented in table 4.8. Survey methodology is summarized at figure 4.23.

		Migrants			Indigenous		
	n	Male	Female	Total	Male	Female	Total
Bayugan III	*28*	10	8	18	7	3	10
Caimpugan	*55*	13	27	40	3	12	15
Maligaya	*53*	19	13	32	11	10	21
Marfil	*13*	4	3	7	4	2	6
Total	*149*	46	51	97	25	27	52

Table 4.8 – Population effectives by subgroup by village

[47] As the name implies, the sample is identified primarily by convenience. Elements are included without pre-specified or known probabilities of being selected. In this case members of the population are chosen based in particular on their relative ease of access. Convenience samples have the advantage or relatively easy sample selection and data collection. However, it is impossible to evaluate the "goodness" of the sample in terms of its representativeness of the population (Anderson *et al.*, 2003).

[48] In purposive sampling, the researcher chooses the sample based on who they think would be appropriate for the study.

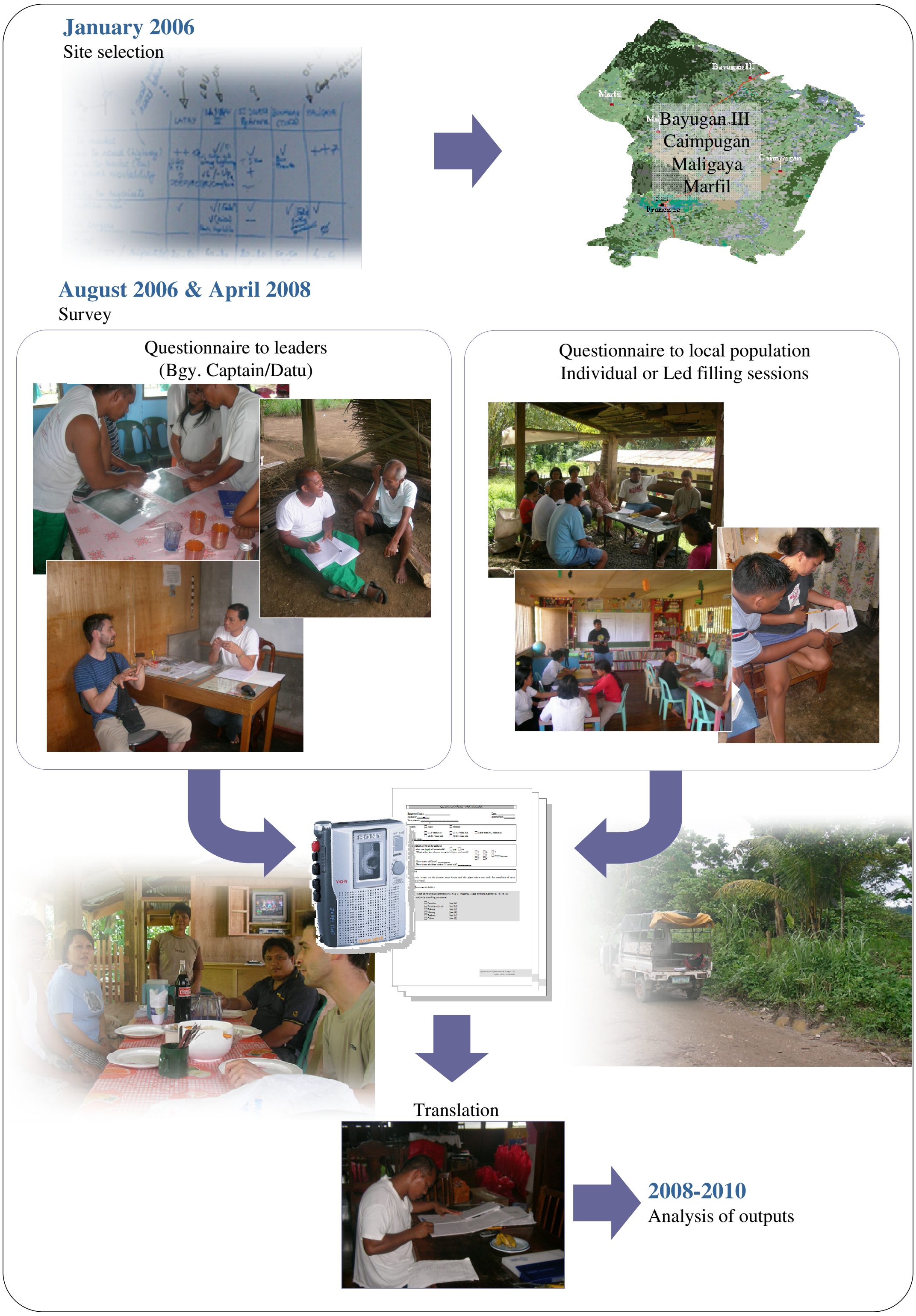

Fig. 4.23 – Survey methodology

Box 8 – Surveys: support and difficulties met
We encountered several technical problems during our investigations. As the surveyed areas were very isolated, we reached the villages often after long hours of van and / or boat - or even swimming! (*). The transport conditions, already precarious, were often poorer due to rain (flooded roads, landslides). Translation problems were also encountered. Indeed, part of the survey population spoke only Tagalog or other local dialects. Finally, several problems of insecurity (armed groups in the forest) have forced us to abandon investigations in some areas. Thanks to the excellent technical and logistical ESSC's support (especially Iris Legal and Joel Fortich) we were able to interact with local people safe and friendly. (*) Indeed, we had to swim across a river to get a boat back lied on the other side, the recall rope having been stolen.

4.5.2.7 Surveys: outputs & findings

Below we make a synthesis of the information gathered from the surveys for the four selected barangays. As the survey has covered other topics than migration like activities, changes, etc., these elements are reported hereafter only if relevant.

a. Arrivals of migrants and their origin

The demographic tendencies illustrated above (*4.3.2.5*) are confirmed (or *partly explained*) by survey results. In fact, from 150 respondents, 86 identified themselves as *migrants* and 76 of these latter gave a year of arrival in their village. Most of them arrived in the villages during the 1980-2000 period. Histograms are given in figure 4.24.

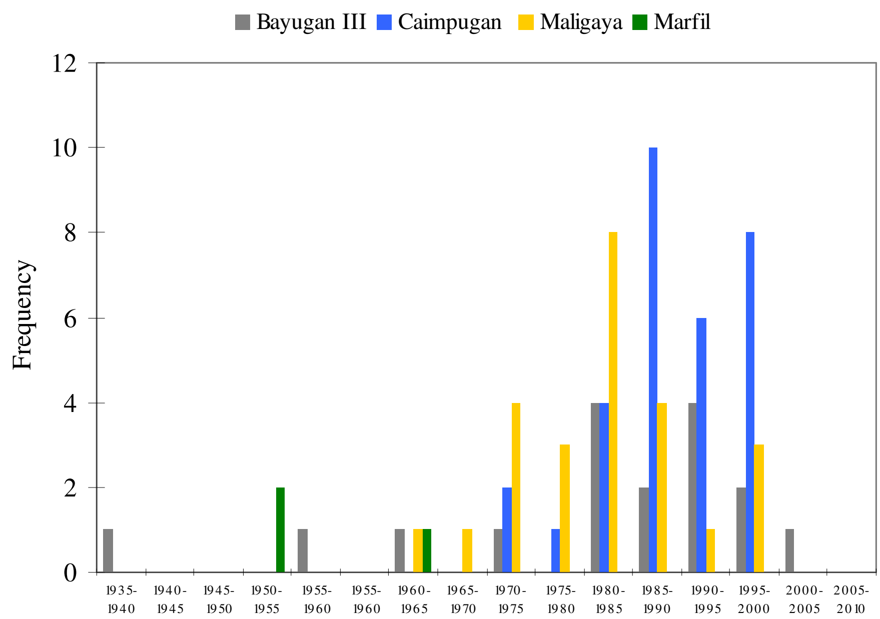

Fig. 4.24 – Histograms, year of arrival (n=76) (source: survey)

Birth by regions of respondents are given in figure 4.25 (table with figures will be found in annex 7). As the number of valid answers (n=4) is very few in Marfil, it is preferable not to take the results from this village into account. For surveyed villages as a whole, all respondents come from Visayas (37%) or from Mindanao (63%).

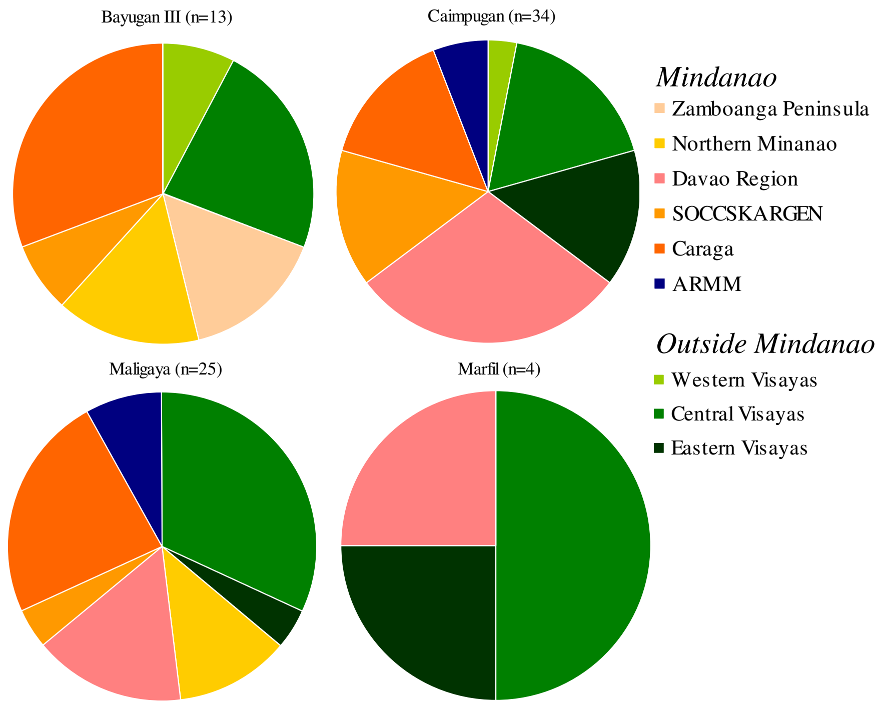

Fig. 4.25 – Migrants by region of origin (source: survey)

Migrants mainly come from the islands of Negros, Bohol, Leyte and Mindanao itself. Let us notice that some migrants come from the Autonomous Region of Muslim Mindanao, (ARMM) North Cotabato, Sarangani, South Cotabato and Sultan Kudarat (SOCSARGEN) and Zamboanga Peninsula escaping probably the insecure areas[49]. It seems therefore that Agusan del Sur was a political refuge area.

b. Reason of arrival

The following graph shows the *reasons of arrival* gathered during the survey (Fig. 4.26). More than one reason could be given.

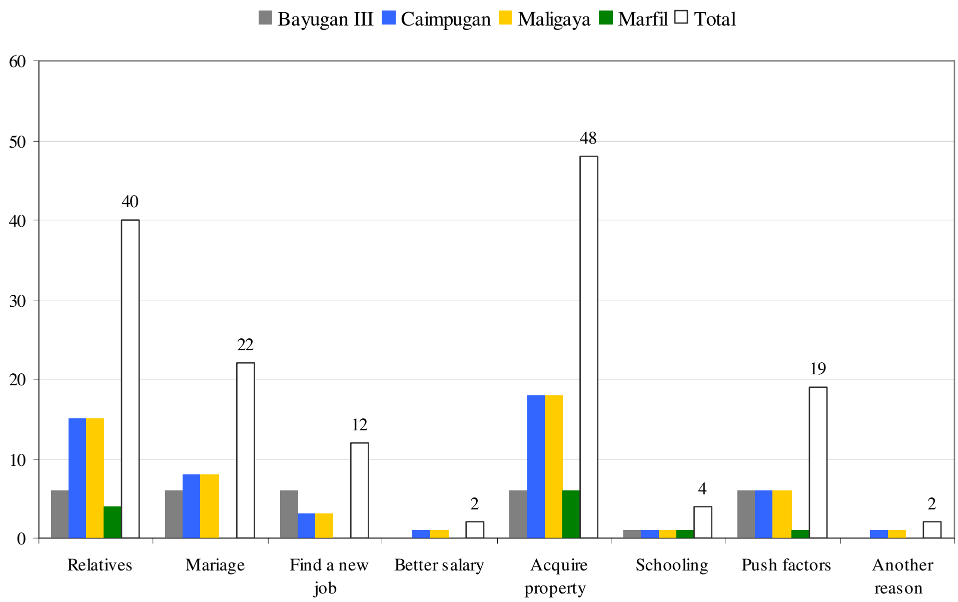

Fig. 4.26 – Reasons of arrival for each barangay

The main expressed pull factor of migration to Agusan del Sur is the will to acquire property and most precisely to get a lot (in order to crop). 32% of respondents have given this reason. The attractiveness of the province is due to the availability of relatively fertile land ("*I have chosen Caimpugan of its land which is very fertile*", "*Land is abundant in the area*", "*A friend of my wife informed us about the area that the land is very fertile and that any kind of crops will grow*", etc.). Caimpugan and Maligaya stand out. In these two barangays, the availability of land/lot is more important than in Bayugan III and Marfil. Effectively, Marfil is covered by a Certificate of Ancestral Domain Claim (CADC) and it is more difficult to settle in

[49] Already subject to insurgency of the communist New People's Army (NPA), south and south-west part of Mindanao Island experience violent events involving MNLF (Moro National Liberation Front) or fundamentalist groups as the MILF (Moro Islamic Liberation Front) or the Abu Sayyaf close to Al-Qaida according to United Nation.

such an area. Bayugan III, on its part, is located along the highway and is more marketed-oriented and traditional agriculture is not a priority for new settlers.

The second major pull factor is the presence of relatives in the village (27% of respondents). Based on information from surveys and informal discussions with local population, it seems that this reason is concomitant to all the others. A migrant chooses to leave and then he selects the place in particular based on the potential presence of relatives.

Other pull factors were reported which appeared to be intrinsic to the barangay. For instance, an important pull factor in Maligaya – as already introduced in background section above – was the creation, in 1980, of the oil palm plantation (PICOP Resources Incorporated) ("*I choose the barangay because jobs are available, there are still available job in the area like gold panning and casual work in the company", Barangay Captain: "They all have the opportunity to look and find a job and avail the work from the company if they really want to work. Men have all the work available but women have less because the work is for men only"*.). A significant number of migrants arrived in Maligaya during the eighties. Previous living places and dates of arrival in Maligaya identified through the survey are presented in the table below (Tab. 4.9):

Interviewee	Previous living places	Date of arrival
1	Bicol (Luzon)	1986
2	Negros, Surigao, San Francisco	2003
3	Misamis Oriental	1986
4	Pagantucan (Bukidnon)	1980
5	Camiguin, San Francisco	1985
6	Rosario	1986
7	Bohol	unknown
8	Rosario	1981
9	Valencia (Bukidnon)	1978
10	Cebu, Bukidnon, Davao	unknown

Table 4.9 – Previous living places and date of arrival of interviewees in Maligaya

Another example is the development of infrastructures and projects in Caimpugan. In fact, as mentioned in Caimpugan Barangay Development Agenda (TWG-BDCC, 2003, p.2), "in 1992 small infra projects started pouring into the barangay (…) and a first rice mill was installed by a private owner while a jetmatic pump was installed by the barangay government as source of potable water". Government project installations continued during the nineties (as the installation of a first multi-grade

primary school) and different infrastructures were constructed. The equipment of barangay since early nineties appears to be therefore one of the major driving factors of in-migration to Caimpugan.
Push factors at origin (sending area) have been also expressed as driving factor of arrival. Among significant factors we find (i) the lack of land[50] (being of course the cause of the will to acquire a land at destination) and (ii) the escape of violence. As already mentioned before, Agusan del Sur as well as its surrounding provinces experienced insurgency and conflicts forcing population to move often.

It is interesting to notice that a pull factor in a place may represent also a push factor in another place. For instance, Maligaya experienced out-migration since fifteen years. According to the Barangay Development Plan of Maligaya, this is because other income opportunities were focusing in other places. In particular some transferred residence, and gold panning activities started to operate near the barangay and this led peoples to leave.

4.6 Conclusion

The fast Mindanao's population growth during the twentieth century is due – in a large part – to influxes of migrants, mostly from the Visayas. Within the island itself, many population movements were also observed. While it is primarily the southern part of the island that has experienced significant in-migration until the early sixties, the northern part and in particular the province of Agusan del Sur encountered a more manifest in-migration after 1960.

The historical context of Agusan del Sur Province allows us to understand its *settling patterns*. A first wave of colonization took place with the Spanish settlers along the Agusan River in the nineteenth century, a second wave, one century later, during the construction of the highway in the sixties. Concomitantly, the population of the province has increased steadily gaining almost 100,000 residents by decades in the second half of the twentieth century.

In respect of assessment methods for measuring migrants' number, about 100,000 people have settled in the province since 1980.

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[50] The lack of land at origin should be compared with the economical climate that dominated the Visayas, the main sending area to Agusan del Sur after Mindanao itself. The Philippines – in particular the Visayas – suffered from a *sugar crisis* during the eighties. This event may account for much of the migrant flow: the peasants abandoned the sugar cultivation to try their luck in Mindanao, while still a *Promised Land*. For an analysis of the causes of the 1983-1984 crisis please refer to Pistorius (1994).

Migration patterns and the factors of migration have been investigated by two surveys concerning four villages. Survey's outputs presented above lead us to validate or invalidate several elements already mentioned before. It appears that (i) massive arrivals have taken place during the eighties and nineties, (ii) the Visayas have been important migrant's sending regions (37% of the migrants) and (iii) the presence of relatives at destination and the will to acquire a plot of land are two main driving factors of migration much more than the distance as an obstacle.

Having painted a portrait of migration in our study area, the challenge now is to see if and how in-migration in the province has influenced the marginality. We must also understand what were the driving factors of migration and marginality and the spatial structures of both phenomena. This is what we will focus in the next two chapters.

Chapter 5

Marginality status in Agusan del Sur Province

The purpose of this chapter is to identify the most marginal areas in the province of Agusan del Sur. The first part of this chapter will be devoted to the mapping of a marginality index based on a Principal Components Analysis (PCA), as presented in paragraph 2.2.3.1 above. This index will be mapped at the village scale. Because spatial isolation (remoteness) has a predominant influence on the marginality level of a given village and may hide local *endogenous* factors of marginality, we develop a second index of marginality to capture what we call *endogenous marginality*.

5.1 Measured marginality *M*

After describing the 14 CBMS *core indicators* that will be used in this research, we will introduce a composite index – based on the Principal Component Analysis – that will capture the level of marginality of each village within the province of Agusan del Sur.

5.1.1 Data

The database we use is the *Community-Based Monitoring System* (CBMS) that we had already introduced in *4.3.3.2*. This database consists of 14 *core indicators* (described in Tab. 5.1). These indicators were defined to assess the Millennium Development

Goals (MDGs) (see annex 8). These indicators cover various fields (income, education, health, environment, etc.). These data were recorded at the national level for each barangay in 2005. Descriptive statistics (minimum and maximum values, mean, variance, etc.) will be found in annex 9.

Box 9 – CBMS database, a tool to fill the gaps

Since poverty reduction has been one of the overarching programs in the national and local levels, ways and means on how to measure and monitor poverty have earned great interest. Income-based poverty indicator and other dimensions of poverty have been used to identify the poor and measure the extent of poverty. National censuses and sample surveys are the often sources of data relating to the different aspects of poverty. However, these are conducted infrequently, in irregular intervals, and in different time periods that make it impossible to draw a comprehensive picture of different dimensions at a particular point in time. Moreover, data from these sources are too aggregated and just provide a lot of information at the national and regional levels but very little at the barangay and individual levels. Two important aspects of empirical study of poverty are their identification and aggregation. The former deals with how one decide who the poor are while the latter deals with the summary of the extent of poverty given the estimates of the poor. Existing national surveys on poverty deal more often on the latter — aggregation and with only sample information on the former — identification. The Community-Based Monitoring System (CBMS) aims to complement the existing national data *to fill in the gaps of information* and enable both aspects of empirical study of poverty (Bancolita and Alvarado, 2006). CBMS is an organized way of collecting household level information at the local level. More than just a data collection tool, it seeks to integrate the use of data in local level development planning and program implementation to support evidence-based decision-making. For more information about CBMS see Reyes *et al*. (2007).

5.1.2 Presentation of the index

Several composite indicators of poverty have been created directly from the database CBMS (Bancolita and Alvarado, 2006). These indicators are developed to identify each household as poor or not poor. They use core indicators as categorical variables. For instance: income poverty > non-poor vs. poor; tenure status > formal settler vs. informal settler; toilet facility > with access vs. without access. Each of the 14 variables is considered to be attained (0) or unattained (1). The severity of poverty is based on the number of variables unattained. Having not such data at the household level, these indicators have not been used.

Previously (Chapter 2, section 2.2) we have discussed about the form of an index of marginality. We concluded that such an index should take into account the economic dimension as well as the socio-political and spatial dimensions. Moreover in this previous chapter, it appeared that the use of Principal Component Analysis (PCA) was a good tool to capture the marginality. For this reason, we take out here the option on developing a marginality index using PCA's results.

This index is based on only 13[51] of 14 of the CBMS core indicators. 40.5% of the information contained in the two first factorial axes, of which 30% in the first (see annex 10 which presents PCA outputs) and no clear opposition between the variables seems to exist. This latter finding confirms the intrinsic usefulness of the CBMS core indicators. Indeed, they were designed to reflect the same reality, poverty, or more precisely the well-being: "[c]ore indicators are being measured to determine the welfare status of the population. These indicators capture the multidimensional aspects of poverty and have been confined to output and impact indicators" (Reyes *et al.*, 2007, p.20).

[51] We did not use the variable P_SQUAT, i.e. the proportion of households who are squatters, in the calculation of the marginality index because a significant part of IPs is itself declared as squatters. As Molintas (2004) says legal and economic factors have led *rendered the indigenous peoples "squatters in their own land"*. The incorporation of this variable would create a bias because we want to identify the links between migrants (i.e. non-IPs) and marginality. PCA incorporating this variable gave two axes F1 and F2 containing 57% of the information (47.6% for F1 and 9.4% for F2). The difference with PCA not including P_SQUAT (41 % explain by the two first axes) confirms the considerable influence that the squatters have on the calculation of marginality.

	CODE	*Description*	*Details*
1	P_CHILDTH	Proportion of children aged 0-5 years old who died	Death occurred after birth up to the age of 5 years. This excludes fetal deaths.
2	P_WM_DIED	Proportion of women who died due to pregnancy related causes	Pregnancy-related death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.
3	P_MALNOUR	Proportion of children aged 0-5 years old who are malnourished	Total number of children aged 0-5 years old who are malnourished over total number of children aged 0-5 years old.
4	P_MKSHIFT	Proportion of households living in makeshift housing	Considered as makeshift housing as those housing structure with makeshift/salvaged materials in walls and/or roof.
5	P_SQUAT	Proportion of households that are squatters	Considered as squatters are those households that live in house and/or lot that they do not own and without permission/consent of owner.
6	P_SAFEW	Proportion of households without access to safe water supply	Considered as safe water supply are community water system, deep well and artesian well whether own use or shared with other households.
7	P_TOILET	Proportion of households without access to sanitary toilet facilities	Considered as sanitary toilet facility are water-sealed flush to sewerage system or septic tank and closed pit, whether own use or shared with other households.
8	P_NOTEL	Proportion of children aged 6-12 years old who are not attending elementary school	Total number of children aged 6-12 years old who are not attending elementary school over total number of children aged 6-12 years old.
9	P_1316NOHI	Proportion of children aged 13-16 years old who are not attending secondary school	Total number of children aged 13-16 years old who are not attending secondary school over total number of children aged 13-16 years old.
10	P_POV_TR	Proportion of households with income below the poverty threshold	Poverty threshold is estimated by inflating the officially released poverty threshold of NSCB for Region or Province using prevailing monthly consumer price indices (CPI) from NSO for the reference period of the survey.
11	P_FOODTR	Proportion of households with income below the food (subsistence) threshold	Food (subsistence) threshold is estimated by inflating the officially released food (subsistence) threshold of NSCB using prevailing monthly consumer price indices (CPI) from NSO for the reference period of the survey.
12	P_FDSHORT	Proportion of households that experienced food shortage	Total number of households that experienced food shortage over total number of households.
13	P_LABUN	Proportion of persons who are unemployed	Considered as members of the labor force are 15 years old above who are employed and those who are unemployed but actively seeking for work.
14	P_VICT_CR	Proportion of persons who were victims of crimes	Household member became a victim of murder, theft, rape, abuse or physical injury regardless of place of occurrence of the crime.

Table 5.1 – Description of the 14 CBMS core indicators (source: Philippine Institute for Development Studies)

Inspired by the literature described in paragraph 2.2.3.1, the idea of marginality index is to use the *eigenvector* of the first axis of a PCA on 13 *core-indicators*. The components of the eigenvector ((f_1, ..., f_n) with n=13) will be used as weights in a linear combination of the 13 *core-indicators* which will express the marginality. *In fine,* for a given village *j*, its marginality value corresponds to its score on the first axis F1.

Formally, the *index of marginality* (*M*) of a spatial entity *j* is expressed as:

$$\begin{aligned} \mathrm{M}_j &= f_1 \cdot \frac{(a_{j1} - m_1)}{s_1} + \ldots + f_n \cdot \frac{(a_{jn} - m_n)}{s_n} \\ &= \sum_{k=1}^{n} f_k \frac{(a_{jk} - m_k)}{s_k} \end{aligned} \tag{5.1}$$

with f_k the first component eigenvector of the *k*-th *core-indicator*, a_{jk} the value of the *core-indicator k* for the spatial entity *j* and m_k and s_k are respectively the mean and the standard deviation of the *core-indicator k* calculated on all the spatial entities. In fact, the $\mathrm{M_j}$ value corresponds to the score on F1, i.e. the orthogonal projection on F1 (Fig. 5.1).

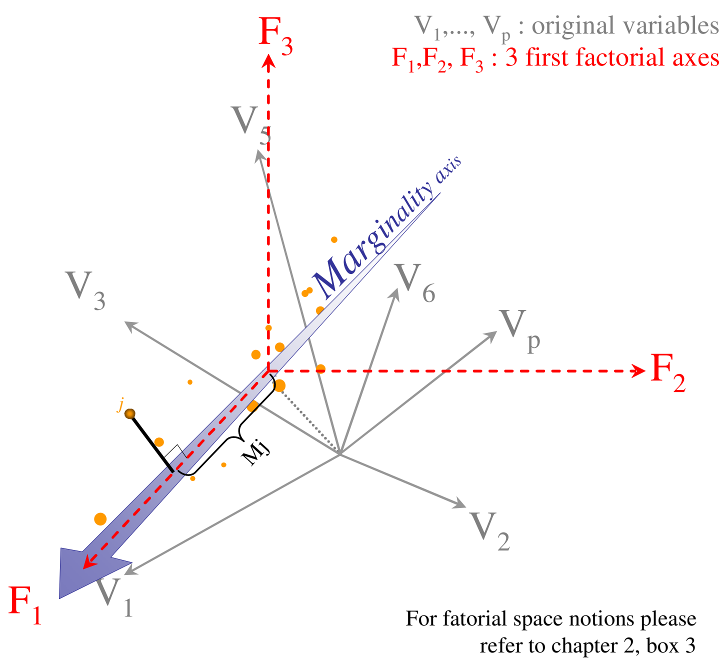

Fig. 5.1 – Marginality values as the scores on F1

The marginality index was calculated for all villages in the province of Agusan del Sur. The common statistics and the histogram are presented below (Fig. 5.2). It appears that the distribution follows a Gaussian shape and it will be interesting to analyze the position of villages from the mean.

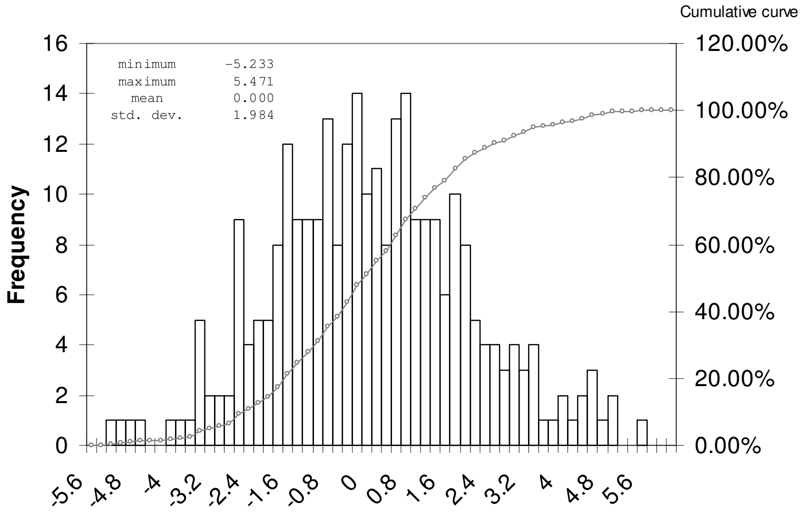

Fig. 5.2 – Histogram of marginality index (*M*) for villages of Agusan del Sur Province

M varies from -5.2 for the less marginal village to 5.4. for the highest. To simplify interpretation and following processes we normalize M^{PCA} (min-max standardisation). As a result, the *normalized index of marginality* – called *M* hereafter – varies from 0 to 1.

The index of marginality is composed of classical "poverty indicators". Nevertheless we call our index "index of marginality". Indeed, like mentioned before, poverty indicators like infantile mortality, education level, access to drinkable water, etc. are notably influenced by remoteness and social and political isolation. We retrieve the three components of marginality described in paragraph 2.3: poverty, remoteness and social and political isolation.

5.1.3 Map of the index of marginality (M)

Spatial distribution of the values of the index of marginality allows understanding the mechanisms of marginality, its structural features and the underlying driving factors. The map of *M* is presented below (Fig. 5.3):

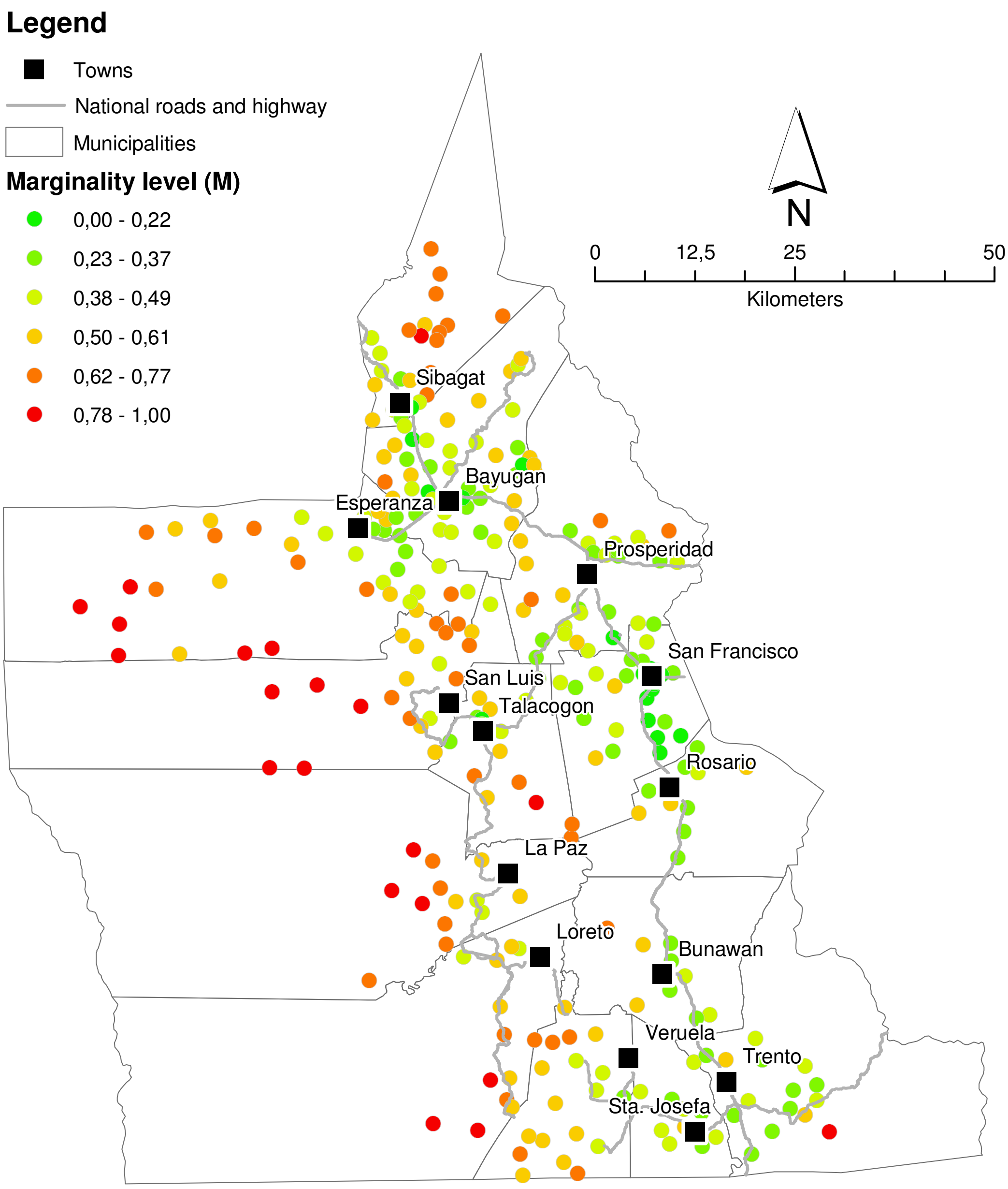

Fig. 5.3 – Marginality level (*M*) for each village within Agusan del Sur Province (natural breaks classification)

The influence of the *highway* is evident by observing the distribution of villages with "low marginality. These are mostly located along the main road. Similarly, *towns*, urban centres in rural areas, also appear to reduce local marginality. The least a village would be isolated from a centre, the more its level of marginality would be low.

5.2 Endogenous marginality: M_{endo}

Many factors may explain the marginal status of a village. Out of them, remoteness from small rural towns is often argued (Bird *et al.*, 2007). However, other factors of marginality may be unique to the village: the heterogeneity of the population, the efficiency of informal social network or community services, the ethnic composition (Curtin et al., 1996; Bird et al., 2002), the soil type or the land cover (Minot et al., 2000), etc. Such factors *not directly related to remoteness*, so-called *endogenous factors* are hereafter assessed below. Indeed, knowing the degree of marginality for each village and its degree of remoteness, marginality can be expressed as a function of the remoteness, and the residuals of this model can approximate an index of *endogenous marginality* free of the intrinsic village's remoteness. The identification of correlations between the endogenous marginality and some socioeconomic and infrastructural variables allows the identification of endogenous factors of marginality.

This idea of "discriminating endogenous factors" occurred very early in development theories, and our *endogenous marginality* concept may be regarded as the counterpart of *endogenous development*, one of the many models of local development (Friedmann and Weaver, 1979; Planque and Lazzeri, 1980; Stohr and Taylor, 1981; Coffey and Polese, 1984; Feyerabend, 1987; Slee *et al*., 1994; Iacoponi *et al*., 1995; Jenkins, 2000). Endogenous development can be understood as a "process of economic growth and structural change, which is led by the local community and employs its potential for development to improve the local population's standard of living" (Vázquez-Barquero, 2002, p.24). In the same way, endogenous marginality can be understood as the marginality resulting of local disadvantages.

5.2.4 Basis: marginality is more than remoteness

As mention in paragraph 2.2.4.4, remoteness is often quoted as a factor of marginality and poverty that might slow down the local development. According to these studies a strong relationship can be established between remoteness and poverty, but remoteness is not the only a cause of poverty. Other factors may explain this and are discussed in many studies (agro-ecology, policy gaps, pressures, etc.); they are often addressed at the regional level. However, as indicated by Ravallion (1996), it is difficult to separate the external effects from purely internal effects. Indeed, facing spatial poverty traps problematics, geographic aggregates do not allow an easy separation between external and internal effects. Some factors of poverty called *endogenous factors* hereafter may be intrinsic to the location.

"Distance from market (…), poor roads and the high opportunity costs of travel time influenced both producers' and consumers' decision-making, reduced farm incomes, the ability of producers to supply food to towns, and the ability of consumers to buy goods and services from urban areas. This suggests that remoteness and physical isolation can damage market integration, adding to the costs of a basket of goods and intensifying the poverty of consumers".

(Bird *et al.*, 2007, p.9)

"Isolation does matter. It affects well-being outcomes and poverty, with a particularly strong impact on chronic poverty."

(Bird *et al.*, 2007, p.29)

5.2.5 Endogenous and exogenous marginalities

We assume that the level of marginality of the villages is not exclusively the result of their remoteness from economic centres (towns and transport network). This is inspired by the Gurung and Kolmair's theory (see section *2.2.2.1 Definitions of marginality*) opposing societal marginality (low social conditions) and spatial marginality[52] (isolation from the economic centres due to a lack of adequate infrastructure) (Gurung and Kolmair, 2005) and meets the recent work of Chasco and Lopez (2009) which distinguish exogenous first nature elements (pure geography) and endogenous second nature factors (man-made agglomeration economies) and try to disentangling them. Indeed, in addition to the contextual factors of marginality (regional political structure, climate, infrastructures, facilities, etc.), considered as exogenous factors to the village, and, in addition to the remoteness of the village itself an intrinsic marginality does exist, which we call *endogenous marginality*, result of local factors. The total marginality measured in a given village would therefore be function of exogenous and endogenous factors[53] (Fig. 5.4).

[52] Gurung and Kollair also indicate that there is a blurred overlap between these two marginalities and speak about *marginality overlap*. This dichotomy has led us (in addition to the influence of classical conceptual Shift-and-Share Analysis (looking for disentangling local and structural effects of regional change)) to propose the concept of endogenous marginality rather close to the Kollmair and Gurung's societal marginality.

[53] Such an *endogenous-exogenous distinction* has already been discussed in other contexts but the meaning of *endogenous* is different. Duraiappah (1998), in a study on linkages between poverty and environmental degradation, distinguishes *endogenous poverty*, defined as *poverty caused by environmental degradation* while exogenous poverty is *poverty caused by factors other than environmental degradation*. This concept is also mentioned among others by Rodriguez (2003).

$$\text{Marginality} = \text{Endogenous marginality} + \text{Exogenous marginality} \quad (5.2)$$

$$\text{Exogenous marginality} = f\,(\text{Remoteness, Regional factors}) \quad (5.3)$$
$$\text{Endogenous marginality} = f\,(\text{Local factors}) \quad (5.4)$$

The existence of an endogenous marginality, if proven, might be efficiently integrated into planning and development policies. Indeed, improving the accessibility (to urban centers) might not necessarily lead to decreasing global marginality (ADB, 2002). As our study covers sub-regional spatial entities (municipalities and villages within the province of Agusan del Sur), regional factors are ignored, since they are the same throughout the study area.

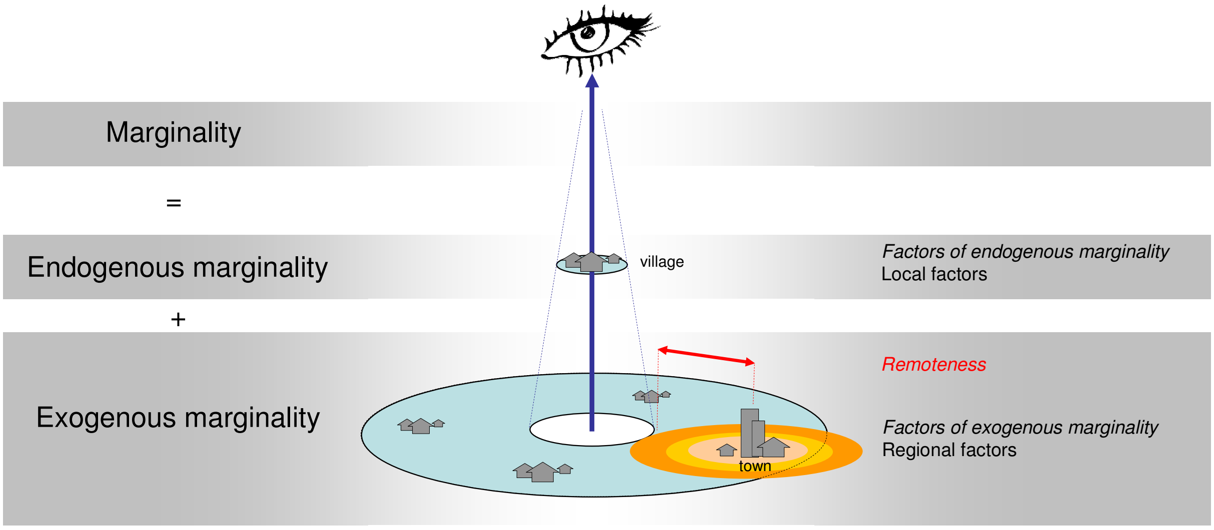

Fig. 5.4 – The concept of endogenous marginality

5.2.6 Remoteness assessment

Several indices of remoteness have been proposed in the literature.

Bird *et al.* (2007) have built two indices, the first one considering remoteness as the average distance to key sites (such as rural centers), the second one based on the accessibility to infrastructure and services (schools, health centers, etc.). As reported by the authors, these indices are purely statistical with no interpretable absolute values, but with a ranking that follows the remoteness.

Oliveau (2004) in his thesis entitled "Modernisation villageoise et distance à la ville en Inde du Sud" has developed an index of "enclavement" (sic in French) (*Ie*). This later is assessed through the square-root and logarithm of the distance functions assuming that the intensity of remoteness decreases with distance acting as powerful brake, especially in the first kilometers.

$$Ie = a * \sqrt{Dv} + b * \sqrt{Dr} + \ln(Dt) \tag{5.5}$$

where *Dv* is the distance to the closest city, *Dr* the distance to the closest road and *Dt* the distance to rail network.

Other studies use a Geographic Information System (GIS) to assess remoteness. The index ARIA (Accessibility Remote Index of Australia) assesses remoteness to service centres taking into account the type of road (CDHAC (1999) and Humphreys *et al.* (2002), Glover and Tennant (2003)). Passegué (1997) developed a grid/raster method to assess the remoteness (in terms of access time) at each point. Reusing and Becker (2003) proposes a method to account remoteness, specifically the identification of central or marginal areas, taking into account the spatial roughness result of friction factors (type of road, slope, land use, etc.) (Fig. 5.5). This method is particularly suitable for studies in the South where accessibility to data is often lacking.

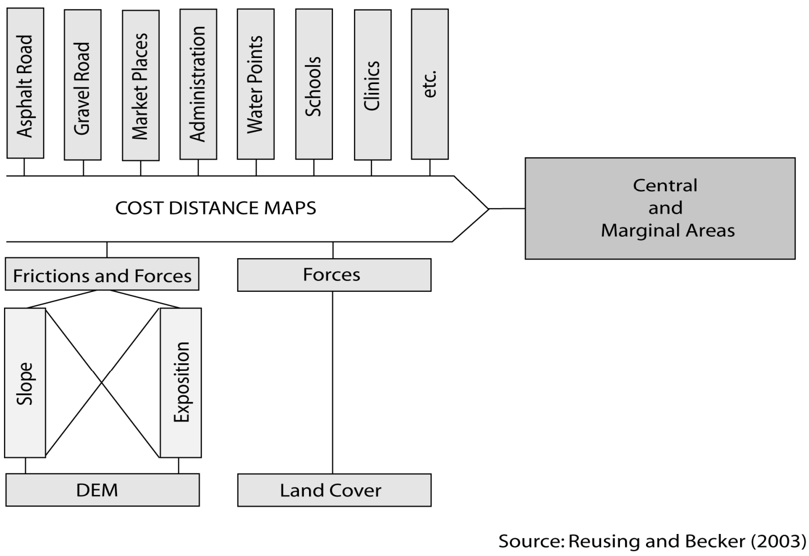

Fig. 5.5 – Roughness and friction factors

Instead of an *a posteriori* approach as developed here above (see (5.4)), we suggest to solve the lack of accurate accessibility data in assessing the remoteness by the use of an *a priori* GIS procedure (Fig. 5.6). A village is considered as remote from a centre if the centre is hard to reach by road. Therefore we evaluated the roughness of the area taking into account the terrain and the road type. Based on digital elevation model (DEM), we calculated the slope in degrees (S). Five slope classes have been identified and we have assigned a coefficient to each class (less than 1 degree (coef. = 1), 1 to 3 degrees (coef. = 2), 3 to 5 degrees (coef. = 3), 5 to 9 degrees (coef. = 4) and more than 9 degrees (coef. = 5)). We also assigned a coefficient to the type of roads (Tr) (concrete and asphalt = easy (coef. = 1), gravel = medium (coef. = 2.6), earth = difficult (coef. = 4), no road = very difficult (coef. = 10)) according to the Accessibility Database of the Province of Rosario (ILO, 2001).

Road roughness coefficients (ρ_r) (Tab. 5.2) are obtained by dividing the maximum speed of each range by the maximum speed of the concrete road range used as a reference.

Type of road	Average speed ($km.h^{-1}$)	ρ_r
Concrete	20 to 40	1
Asphalt	20 to 40	1
Gravel	10 to 15	2.6
Earth	5 to 10	4
No road	2 to 4	10

Table 5.2 – Road roughness coefficients by type of road

Space roughness (ρ_s) is obtained by combining slope (S) and road roughness (ρ_r) following:

$$\rho_s = S \,.\, \rho_r \tag{5.6}$$

A remoteness map is produced by applying a CDW function to ADS towns under ρ_s as a constraint. The GIS process cost functions are similar to Euclidean functions, but instead of calculating the actual distance from one point to another, the cost functions determine the shortest weighted distance (or accumulated travel cost) from each cell of a grid to the closest cell in all the source-cells. This spatial roughness is introduced as a constraint in a cost-weighted distance function (CWD). This function has been particularly described by Douglas (1994) and Lee and Stucky (1998). Specifically, the CDW function uses the location of towns as source grid and the spatial roughness ρ_s as friction grid. As a result an output grid will assign a value to each cell corresponding to the cumulative distance cost to the nearest source.

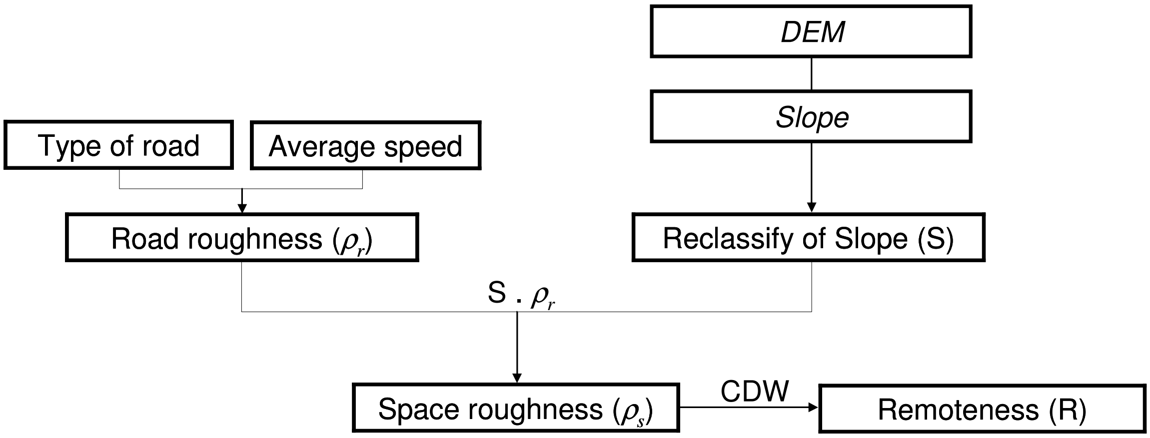

Fig. 5.6 – GIS procedure to assess remoteness

As expected (Fig. 5.7), remoteness increases as one move away from roads and towns. This result is used to remove the remoteness influence from the total measured marginality (*M*) in order to better approach the endogenous marginality.

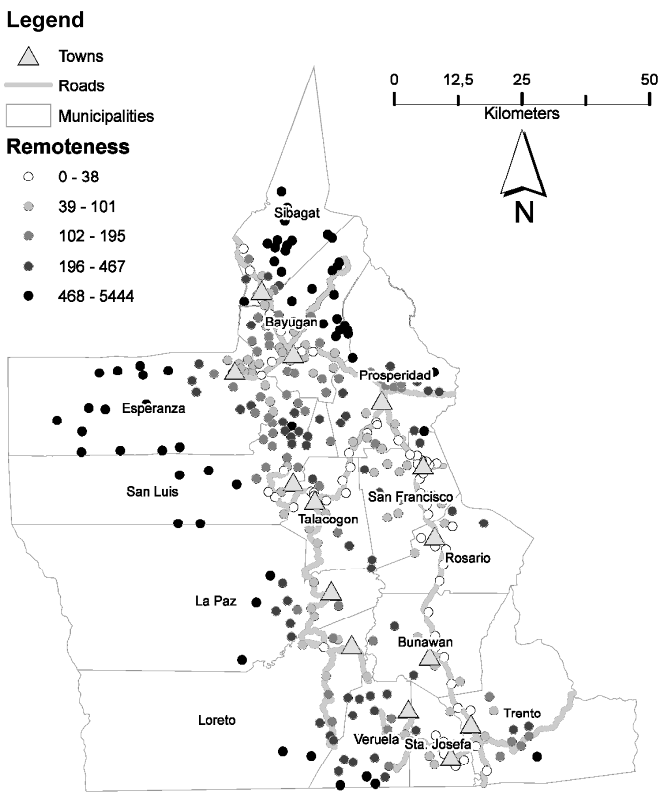

Fig. 5.7 – Remoteness at village level

We performed a test of correlation between computed remoteness and the exhaustive list of CBMS *core indicators* (Tab. 5.3). It appears that about half of them are significantly related to isolation. Remoteness seems to have a significant influence on the observed marginality.

CODE	*Description*	r
P_1316NOHI	Proportion of children aged 13-16 years old who are not attending secondary school	0.450 ***
P_CHILDTH	Proportion of children aged 0-5 years old who died	0.098
P_FDSHORT	Proportion of households that experienced food shortage	0.267 ***
P_FOODTR	Proportion of households with income below the food (subsistence) threshold	0.370 ***
P_LABUN	Proportion of persons who are unemployed	-0.071
P_MALNOUR	Proportion of children aged 0-5 years old who are malnourished	-0.044
P_MKSHIFT	Proportion of households living in makeshift housing	-0.058
P_NOTEL	Proportion of children aged 6-12 years old who are not attending elementary school	0.448 ***
P_POV_TR	Proportion of households with income below the poverty threshold	0.373 ***
P_SAFEW	Proportion of households without access to safe water supply	0.273 ***
P_TOILET	Proportion of households without access to sanitary toilet facilities	0.393 ***
P_VICT_CR	Proportion of persons who were victims of crimes	0.016
P_WM_DIED	Proportion of women who died due to pregnancy related causes	0.031

*** (significance level) : p-value < 0.0001

Table 5.3 – Correlation between *core indicators* and remoteness

5.2.7 Endogenous marginality assessment

Endogenous marginality is considered as marginality unexplained by remoteness. Considering that our study covers sub-regional spatial entities, regional factors (cf. 5.3 formula) are ignored since they are the same throughout the province. When we report *M* and R in a graph, marginality appears to have a logarithmic trend (strong increase followed by stabilization) (Fig. 5.8).

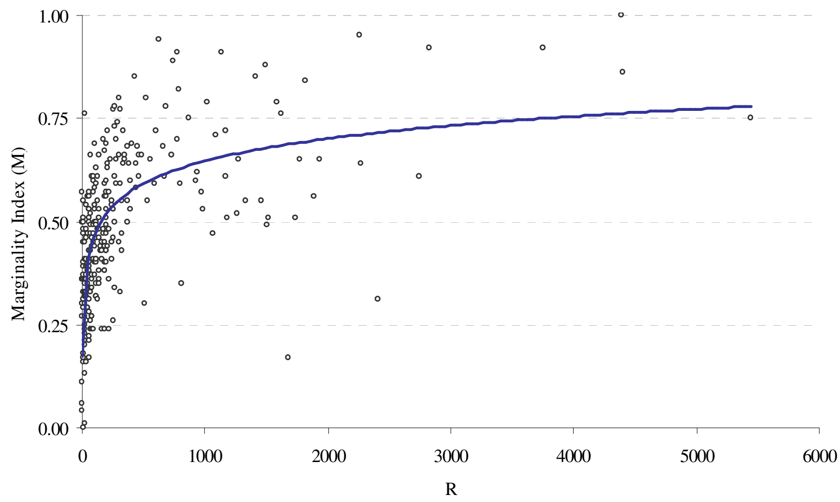

Fig. 5.8 – Logarithmic trend of marginality

Therefore, to approach endogenous marginality, we suggest to consider the residuals of a linear regression (Fig. 5.9) that will express the total marginality (M) as a function of remoteness (R).

$$M = 0.0754\text{Ln(R)} + 0.1224 \qquad (5.7)$$

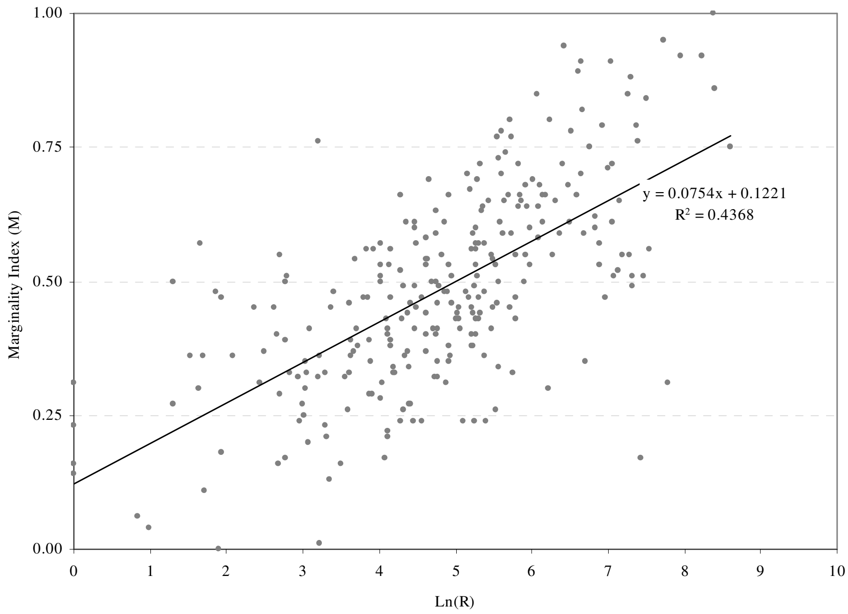

Fig. 5.9 – Marginality as a function of Remoteness

According to this model, marginality (*M*) varies positively with the natural logarithm of remoteness. In other words, marginality is low when remoteness is low and increases with it, but stabilization is reached when remoteness is high. A manifest dispersion is quoted around the regression line (r^2 = 44%) proving the high influence of an endogenous marginality that is not exhaustively captured by the remoteness indicator (more than half). The residuals of the model (5.7) are independent of the explanatory factors of the model proving the absence of statistical 'endogeneity bias'[54]. These residuals express the *endogenous marginality* (Fig. 5.10). A model without outliers has been tested in order to remove potential *leverage effect*. The coefficient of determination increases slightly in this case to 47% (+3%). As the leverage effect is moderate, we do not use this last model. Moreover, outlier villages may be instructive, could help identifying local peculiarities and would be helpful to understand marginality mechanisms through these 'local anomalies'.

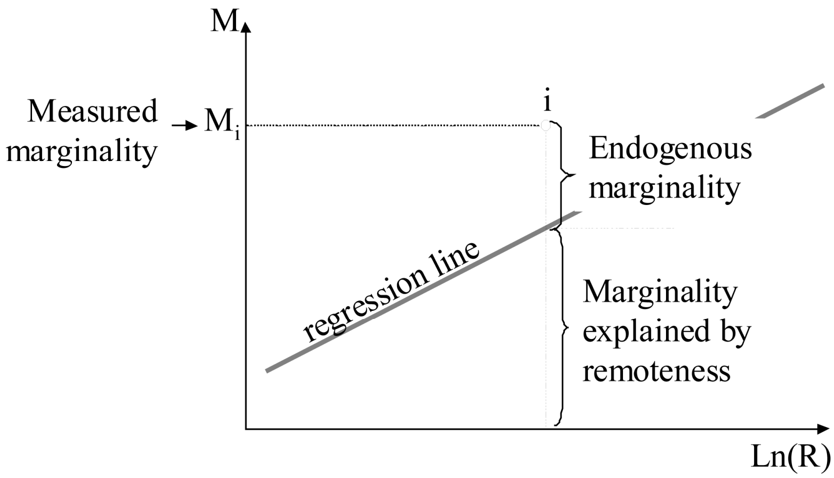

Fig. 5.10 – Measured marginality, marginality explained by remoteness and endogenous marginality

The mapping of these residuals at village level shows the importance of their Endogenous marginality (Fig. 5.11). A low endogenous marginality (green colours on the map) corresponds to a measured marginality lower than expected according to model (5.7) while a high endogenous marginality (red colours on the map) corresponds to a measured marginality higher than expected.

[54] There is an *endogeneity bias* when a correlation is observed between residuals and one explanatory variable.

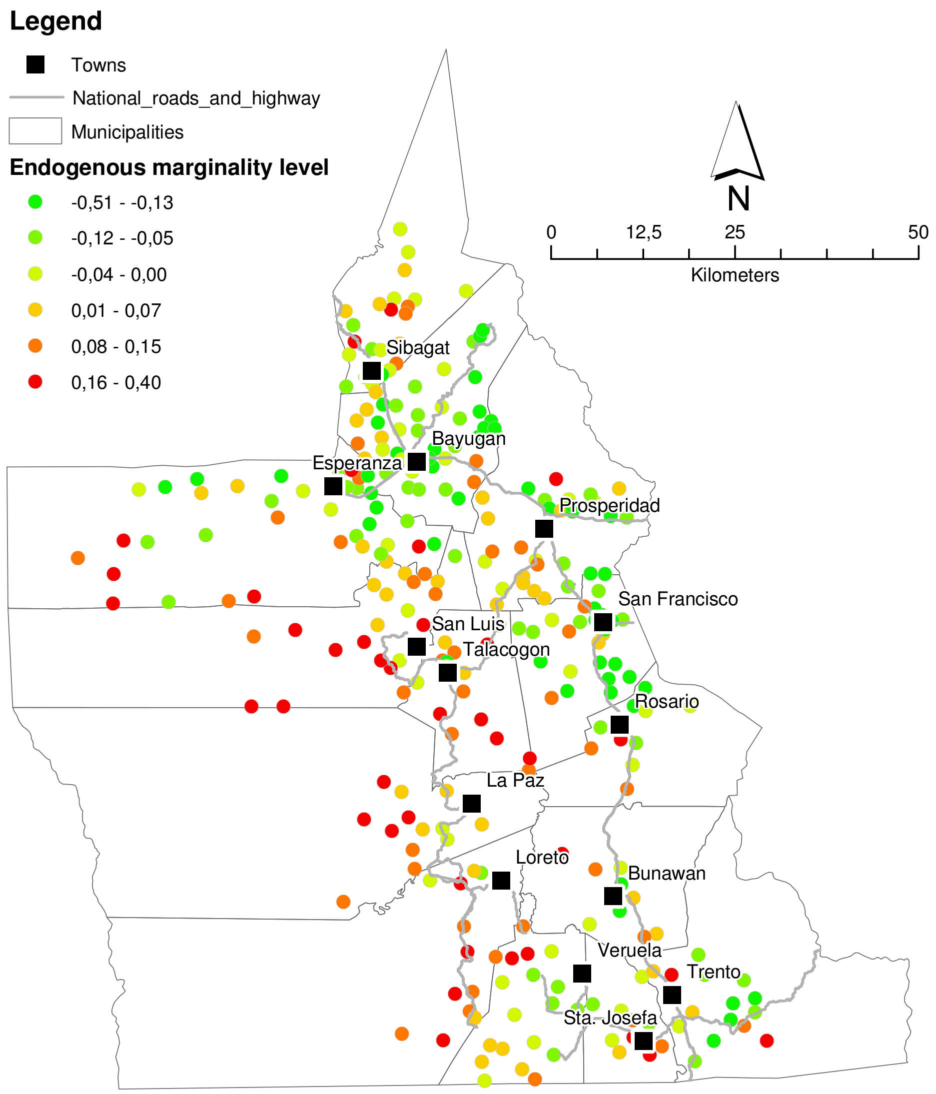

Fig. 5.11 – Endogenous marginality (natural breaks classification) for each village within Agusan del Sur Province

The concentration of low endogenous marginality spots around towns suggests that this proximity induces positive spillover effect[55] that might reduce the marginality. This confirms that a low total measured marginality (Fig. 5.3) in villages surrounding

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55 The *spillover effect* underlies that migration can accelerate a movement of "income-diversification" thanks to the multiple networks of migrants (social networks, labor market network, etc.) (see in particular Iversen (2006) and Schejtman *et al.* (2006)). This effect is to be connected to the *urban-rural linkages* (links between an agricultural hinterland and an urban nucleus (Schultz (1953), Katzman (1974)).

towns is not only due to their spatial proximity of such towns but may be due to intrinsic factors.

The graph crossing M values and M_{endo} values shows a positive relation and indicates that other factors than remoteness may explain marginality.

5.3 Conclusion

Based on community data (CBMS) at village level, we have assessed the marginality intensity thanks to an index built from Principal Component Analysis outputs. The mapping of marginality reveals that the road infrastructures (highway) as well as the topography play a structural role at the province scale. Remoteness, i.e. the spatial isolation, seems to strongly influence the marginality of villages. Many studies identify remoteness as an unfavourable factor to the development of a village or a region and do not offer alternatives to go further. But other factors are also mentioned in the literature: the heterogeneity of the population, the efficiency of informal social network or community services, the ethnic composition, the soil type or the land cover and such factors can be hidden by the remoteness of the villages. For this reason, we have proposed a methodology that will allow the bypass of remoteness so that we will focus more on such spatial and endogenous influential factors. After the assessment of marginality level, we assess the remoteness thanks to spatial modelling (GIS) – the remoteness being expressed as a function of (i) the road type, (ii) the distance to towns and main roads, and (iii) the topography. Finally, the marginality “free of remoteness” – so-called *endogenous marginality* – is considered as the residuals of a regression model linking marginality and remoteness. In the next chapter, we try to identify the major driving factors of marginality through statistical explanatory methods.

Chapter 6

Environment, Socio-economy, Marginality nexus

In the previous chapter, we developed a methodology that enabled the researcher to locate the relative higher marginal areas in the province. It is necessary to understand what factors explain this marginality and the role of migration. Initially, we focus on identifying the linkages between environment and marginality as well as relations with the migration in particular. To do this, we analyze the Land Use, Land Use changes and the tenurial instruments with regard to the marginality level. In a second step, demographic influences on marginality are assessed. A modelling procedure shows that, besides remoteness, an underlying population size effect and an in-migration effect on marginality seem to exist. However, other determinants of endogenous marginality are not captured by the effects quoted above. This led us, into a third step, to the use of a wider panel of explanatory data. Correlation analysis at provincial and municipal levels, help in the identification of the underlying determinants for marginality and/or endogenous marginality.

6.1 Environmental factors and marginality-migration nexus

In this section, we endeavour to identify what environmental factors, such as land cover, land use, or the tenure, might explain or be explained by the marginality level or the presence of migrants. Indeed, on the one hand as already mentioned in Chapter 2, a limited or altered natural capital may be the roots of *spatial poverty traps* or marginal situations (Gurung and Kollmair, 2005; Bird *et al.*, 2007). On the other hand in-migration is often accompanied by change of the existing land structure or by a degradation of the natural capital (Homewood *et al.*, 2004; Black and Sessay, 1997). Poor living conditions (poverty, marginalization, oppression, etc.) may also lead to non-sustainable uses of the environment. Numerous complex relationships between environmental degradation and poverty have been reported (Broad, 1994; Martinez-Alier, 1995; Reardon and Vosti, 1995; Duraiappah, 1998) (Fig. 6.1). The latter is sometimes the cause of degradation, sometimes the consequence of it. Often many *feedback loops*[56] exit between the two phenomena.

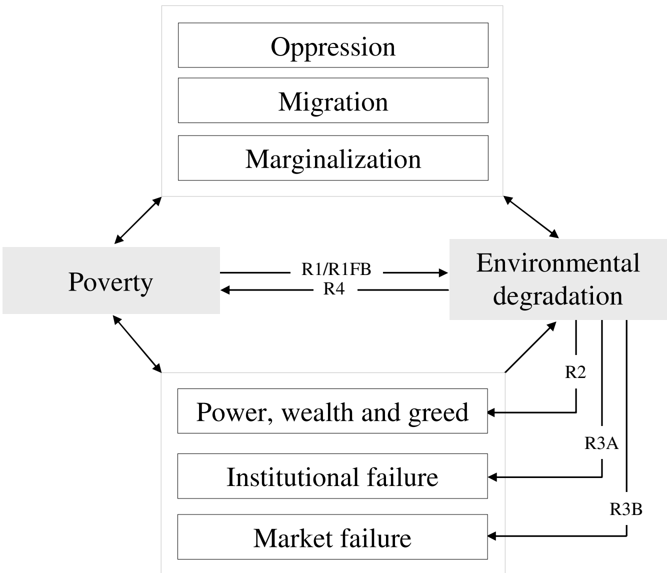

Fig. 6.1 – Possible relationships in the poverty-environmental degradation nexus (adapted from Duraiappah, 1998)

[56] As mentioned by Duraiappah (1998) the presence of poverty due to environmental degradation (R4) can set into motion an R1-type link. In this case, it is a poverty caused by environmental degradation (this type of poverty is named by the author *endogenous poverty*) which causes the environmental degradation (R1FeedBack or F1FB).

Several of these different relationships are encountered depending on the exploiting activities. To take an example, it is generally accepted that deforestation is generated by three major activities – logging, agriculture and fuel food – which have their incentives (market, land security, food security, and basic needs), their agents (commercial and small holdings) and their own motivations (profit or subsistence). Each of these activities has one or several influences sometimes antagonistic (table 6.1).

Activity	Agents	Motives	Incentives	Relationship
Logging	Commercial	Profit	Market, government policies	R2,R3A,R3B
Agricultural/pastoral	Commercial	Profit	Market, government policies	R2,R3A,R3B
	Small holdings	Subsistence	Food security	R1FB
Fuelwood	Commercial	Profit	Insecure land tenure, govmt. policies	R2,R3A,R3B
	Small holdings	Subsistence	Basic needs	R1FB

Table 6.1 – Activity-relationship links for forest use (Duraiappah, 1998)

We may legitimately expect that (i) the massive in-migration experienced by the province of Agusan del Sur as well as activities related to its demographic development have substantially altered the provincial environment and that (ii) this environmental change has had an impact on the populations' marginality level[57].

The overlapping of these phenomena and the feedback loops from environmental degradation to poverty make the process of identifying causality links a non-trivial exercise. The purpose of this section will be primarily to identify correlations between phenomena much more than to look for causal relationships.

Agusan del Sur has always enjoyed a significant environmental capital. Its forest and mineral resources were particularly great at the beginning of the last century. They have drastically declined mainly due to industrial and commercial exploitation (export trade oriented) by both Philippine and foreign companies. The decline of forest in the Philippines has already been mentioned in Chapter 3 (section 3.2). Mindanao has been one of the most affected regions: between 1875 and 2003, 67% of the primary forest

[57] We invite also the reader to consult the work of Reardon and Vosti (1995) as well as Fisher and Hirsh (2007) which analyze the links between poverty and the environment in rural areas of developing countries. But keep in mind that "the links between poverty and environment in a given setting depend on the level, distribution, and type of poverty, on the type of environmental problem, and on conditioning variables. As these change over contexts, the direction of causality and the strength of the links can change." (Reardon and Vosti, 1995, p. 1504)

has disappeared[58]. Similarly, exploitation of mineral resources has steadily grown during the 20th century. Consequently, some regions have experienced natural resources' damages more intense than elsewhere. Moreover, the development of cash crops since the Second World War in the province of Agusan del Sur has completely changed the land cover (then essentially homogeneous) which is today much more heterogeneous, anthropized and degraded.

It is therefore reasonable to expect that the environment (more or less degraded) may influence the local marginality. On the opposite, the exploitation of local natural resources may reduce marginality if – for instance – local people are employed by an extractive firm and that wages are reinvested into the local economy.

The first part of this section devoted to environment and marginality-migration nexus confronts – through correlation analysis – the level of marginality and the local environment to validate or not the existence of *environmentally linked marginality factors*. In a second part, we assess land use change based on satellite and airborne images analyses in order to highlight potential relationships between environmental changes, marginality and migration.

6.1.1 Local Land use, Marginality and Migration

The literature reports the existence of numerous links between land use, marginality and migration. The main land use types in Agusan del Sur Province – illustrated below (Fig. 6.2) – are large-scale plantations (about 32,000 ha), irrigated and rainfed agriculture (about 45,000 ha) and forest land (about 450,000 ha) (source: Agusan del Sur Profile 2002)– more or less altered. Each of these land use may have positive or negative consequences in term of marginality. We present below elements frequently reported in the literature. Then we formulate hypotheses for Agusan del Sur Province.

6.1.1.1 Literature

Regarding plantations, the arrival of plantations often comes along with an *opening-up effect* which results in the creation of *substantial social and overhead capital* (Beckford, 1999). Places in developing countries "have undoubtedly benefited from the plantation-induced supplies of roads, railways, ports, telecommunication, water supplies, electricity, schools, clinics, and hospitals which now exist in places that

[58] Calculation based on figures from Vidal and Soler (1875) *in* Bankoff (2007) and Department of Environment and Natural Resources (2003).

otherwise would certainly be without these amenities." (Beckford, 1999, p. 184) Economically, plantation has frequently, in a first time, a socioeconomic advantage when compared with smallholder agricultural systems: large-scale production is in many cases more economical (through economies of scale), and plantations offer labor and income for hundreds of thousands of people. In most situations plantation agriculture is a profitable business and earns foreign exchange (Hartemink, 2005). However, the effects of plantations have to be more qualified. The extensive developments of territories for monoculture, i.e. plantations, raised numerous questions about their impacts on the local populations and the consequences to the environment (Beckford, 1999; Bissonnette and Bernard, 2008; Marti, 2008).

For instance, a major economical disadvantage is the financial risk due to fluctuating world market prices (Hartemink, 2005) and could lead to massive job losses. Hontiveros (1988) in a study on the valley of Agusan reports numerous conflicts between plantation companies and local populations. According to him the inconveniences – land pressures engendered by plantations - undergone by the local communities are much more important than the profits which may be generated[59].

[59]In 1988, British Parliament Fact-Finding Team reports several criticisms expressed by the local populations. The plantations are criticized on the grounds that: i) plantation development in inherently disadvantageous to the communities involved, ii) this forms of capital development was only be provided by multinational companies which do not have the interests of the host country - let alone - the community premises - at heart (BPFFT *in* Hontiveros, 1988). More recently, others have reported negative effects on local communities especially the indigenous populations (Undag, 2008; Marti, 2008).

Fig. 6.2*a* – Irrigated agriculture landscapes – Agusan del Sur

Fig. 6.2*b* – Oil Palm plantations, Agusan del Sur

Regarding irrigated agriculture, such a system may be a vehicle to provide basic needs for, and reduce the vulnerability of, poor people (FAO, 1999). Irrigation brings a range of benefits to individuals and households like for instance an increased and more stable flow of income from farming made possible by increased intensity of cropping and improved yields (Shah, 1993). It is generally admitted, based on empirical studies, that irrigation has many positive effects both at household, sub-national and national levels (Hussain and Hanjra, 2004). Thereby irrigation is a negative determinant of poverty, and incidence, depth, and severity of poverty are lower in irrigated than in rainfed settings.

Regarding forest lands, numerous studies report its close links with poverty (e.g. Gibson *et al.*, 2000; Geist and Lambin, 2001; de Sherbinin *et al.*, 2007). Very large numbers of the rural poor derive some part of their livelihood inputs from forest resources, in different ways and to different extents (Arnold, 2001). When forest exploitation is rampant, the expected impacts are similar to those observed for plantations. Oftentimes, local people endure if they do not work in the logging business (land pressure, environmental degradation) (Dauvergne, 2001; Guiang, 2001). However large areas of logging provide income but the contracts are often seasonal or even daily. The uncertainty to get a substantial additional income from logging business is really so important.

Small-scale forest product processing constitutes another important part of the rural economy (Arnold, 1987; Anderson and Ioris, 1992, Arnold and Townson, 1998). Lots of rural households in developing countries are still subsistence users of forest / tree products. In a strategy of diversification, exploitation of non-wood products often provides additional income. Moreover, market access is very limited in closed canopy forest. The open canopy[60] and shrubs allow more the development of cash crops and the adoption of diversification strategies.

Regarding Land Use-Migration links, migrants – escaping unfavourable situations – settle preferentially close to productive land use. Indeed, in-migrant people seek for a job, for a better salary, for a plot and more generally for a better livelihood. In-migrants are attracted by the opportunity to grow cash crops, to work in export-oriented labor-intensive activities, etc. (Budelman and Zander, 1990; Deshingkar, 2006). Often they take advantage of the establishment of activities such as logging

[60] Open canopy, with trees spaced further apart, allows more sunlight to penetrate to the ground between them.

(Poffenberger, 2006)[61]. As a result, in-migrants are often associated to particular land use types (plantations, mining, irrigated agriculture, etc.) but also by cities or towns providing jobs (services, manufacturing).

6.1.1.2 Hypotheses

Aware of the literature findings, our field work (as reported in chapter 4) and the provincial context, we formulate six hypotheses for Agusan del Sur about *local land use, marginality and migration*:

Hypothesis 1: Plantations in Agusan del Sur Province – having globally induced supplies and/or decreased remoteness – are associated with low marginality levels.

Hypothesis 2: Irrigated agriculture in Agusan del Sur Province is associated with low marginality levels.

Hypothesis 3: Secondary forest (open canopy, shrub, etc.) despite environmental degradation is associated with lower marginality levels than primary forest (close canopy), considering that secondary forest has a more dense transportation network and as a consequence a better accessibility to market.

Hypothesis 4: Migrants have been attracted by land use providing job opportunities (built-up areas, plantations, logging and irrigated agriculture).

Hypothesis 5: Migrants have induced locally an economic dynamism leading to low marginality levels.

[61] To go further this element is to associate to pressure experienced by IPs. Indeed, as mentioned by Poffenberger (2006) migrant people have often followed the commercial loggers, entering on their dirt roads to open fields on marginal upland slopes. The pressure has frequently displaced indigenous people, pushing them further up the mountain and into more critical forest areas.

6.1.1.3 Data and Methods

Given that the CBMS database on the one hand provides for each village the percentage of households working in the forestry and in the mining sectors, the two main extractive activities of local natural resources, we compute the correlation between these data and the level of marginality assessed in chapter 5.
As the meantime, the land use classification was computed by our local partner, ESSC, based on two Landsat ETM+ images (1999 and 2001), for each village, we identify the composition of the land use in its *surrounding environment* (percentage of each type of land use) (Fig. 6.3). The surrounding environment of a village is determined by a circle whose radius is proportional to its population (in meters) centred on the village centre[62] (i.e. a *population-sized buffer*). For example, the surrounding environment for a village of 2,000 inhabitants is delimited by a circle of 2,000 meters and for a village of 2,500 inhabitants with a circle of 2,500meters[63].

6.1.1.4 Results

Correlations between natural-resources exploiting activities (CBMS database) and marginality show that high marginality levels are strongly correlated with crop farming and gardening (r = 0.72) and forestry (r = 0.41) while a slight inverse relation is observed for mining (r = -0.19). This first result leads us to validate, without any surprise, a strong influence of activities on marginality. A deeper analysis of activities-marginality relationships is given further (see section 6.3).

Table 6.2 allows identifying the (positive or negative) relationship between marginality and land use types. We indicate in this table the proportion of migrants to observe the possible correlations with marginality and land use.

[62] The village centres are defined by the x-y coordinates of shapefiles digitized by ESSC.
[63] The use of a distance proportional to the village's population to assess the influence of the village on its surrounding environment was used in particular by Gilruth *et al.* (1995).

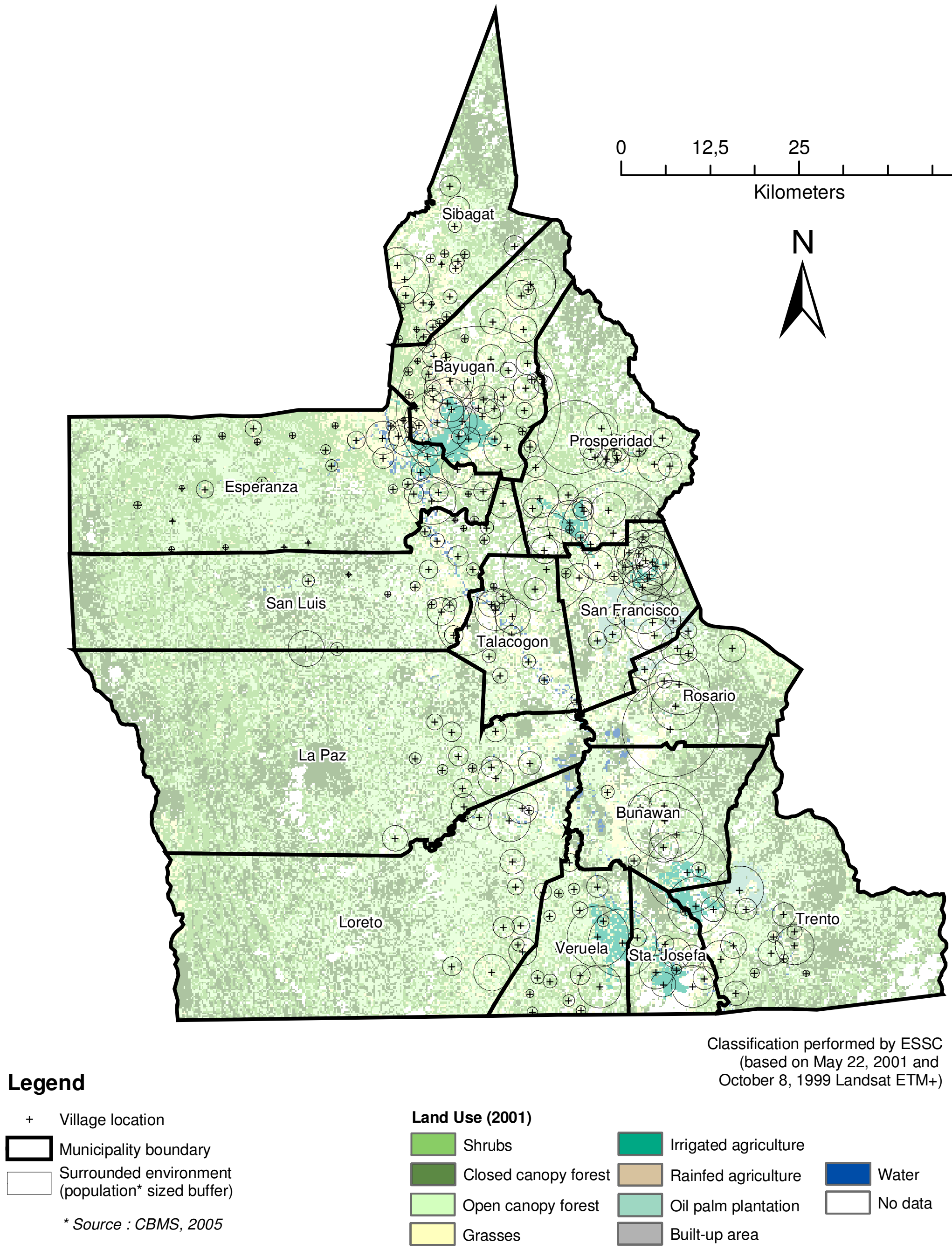

Fig. 6.3 – Land Use (2001) and village's surrounding environment in Agusan del Sur Province

A stronger positive relationship exists between marginality and Open Canopy (r=0.32) and Shrubs (r=0.28). Negative relationship exists between marginality and Built-up areas (r=-0.23), Irrigated Agriculture (r=-0.22) and Oil Palm plantation (r=-0.21).

A proportion of migrants is positively correlated to Built-up areas and Irrigated agriculture (r=0.20). These results led us, without allowing to highlight the timing of events, to consider a double migrants effect: migrant were attracted in the past by economic nuclei, which have grown-up resulting today to a strong regional economical dynamic. These considerations will be enlarged below.

	Migrants (%)	M	M_{endo}	Closed Canopy (%)	Open Canopy (%)	Shrubs (%)	Grasses (%)	Irrigated agriculture (%)	Rainfed agriculture (%)	Oil Palm Plantation(%)	Built-up (%)	Water (%)
Migrants (%)	1.00	-0.56	-0.34	0.13	-0.16	-0.17	0.05	0.20	0.16	0.05	0.20	-0.08
M	-0.56	1.00	0.75	-0.16	0.32	0.28	-0.14	-0.22	-0.18	-0.21	-0.23	-0.03
M_{endo}	-0.34	0.75	1.00	-0.12	0.22	0.07	-0.05	-0.07	-0.14	-0.21	-0.16	0.05

Table 6.2 – Pearson correlation coefficient between M, M_{endo}, proportion of migrants and land use (% in surrounding environment)

The analysis above only expresses marginality, migration and surrounding environment links. It is not possible – through such an analysis – to assess how much marginal a given land use is in comparison to another one. For this reason, we identify for each village the *dominant land use type* (in surface) in its surrounding environment. Mean values for both marginalities (M and M_{endo}) and the proportion of migrants by dominant land use are given in table 6.3. It appears that the average marginality (mean of M) is more important in forested environment (open canopy and shrubs) than in anthropic environments[64]. This result is consistent with the previous one. Over that information about association, quantitative comparisons are possible. For instance, villages in open canopy forest are, on average, about twice[65] as marginal as villages in open palm plantation. Even if the mean of the endogenous marginality values are lower than the mean of marginality, statistical significant differences are

[64] Let us notice that the closed canopy forest concerns few small villages (11) all located along the highway. In these cases, by construction, the dominant land use is calculated on a lower surface and the closed canopy forest is rather fragmented.
[65] 0.583/0.311 = 1.87

observed between environments for endogenous marginality[66]. Anyway, raw endogenous marginality values are not easily interpretable at this stage. Indeed, even if they are statistically significant, the endogenous marginality's differences are weak. For instance, it is rather difficult to explain – at this stage – why endogenous marginality is higher for shrubs (-0.002) than for grasses (-0.020).

	Closed Canopy Forest	Open Canopy Forest	Shrubs	Grasses	Irrigated Agriculture	Oil Palm Plantation
No. of observations	11	59	125	52	27	9
M (mean)	0.323	0.583	0.512	0.447	0.386	0.311
M_{endo} (mean)	-0.115	0.068	-0.002	-0.020	-0.013	-0.141
% of migrants (mean)	0.816	0.537	0.719	0.763	0.842	0.782

Table 6.3 – Mean for M, M_{endo} and the proportion of migrants by dominant village's surrounding environment (Agusan del Sur)

A similar analysis, confronting land cover type and marginalities, has been performed using another satellite classification in 2003 (ESSC). The use of this classification is interesting because (i) cover types are slightly different from previous classification (2001) and therefore provide additional information, and (ii) optional validation of the previous results is made possible. The basic statistics for M and M_{endo} are given below (Tab. 6.4).

Land Cover Type	*Villages (#)*	*%*	*M (average)*	*M_{endo} (average)*	*Proportion of migrants*	*Population*
Wooded grassland	124	44%	0.53	0.00	0.68	164,458
Built-up areas	2	1%	0.11	-0.25	0.93	13,821
Cultivated	84	30%	0.41	-0.01	0.75	177,610
Forest, covered canopy	1	0%	0.53	-0.01	0.69	1,528
Forest, open canopy	27	10%	0.62	0.06	0.55	23,303
Grassland	18	6%	0.54	0.02	0.63	23,634
Inland water	0	-	-	-	-	-
Marshland	0	-	-	-	-	-
Plantation	23	8%	0.35	-0.10	0.76	19,305

Table 6.4 – Average marginalities, proportion of migrants and population by land cover type

[66] The non-parametric Kruskal-Wallis test (designed to test k samples) indicates that the six samples (corresponding to the six surrounding environments) are significantly different ($p<0.0001$).

Again marginality (*M*) varies inversely to the *environmental alteration*: marginality is low in built-up areas (0.11)[67] while this value is medium in plantation and cultivated areas (resp. 0.35 and 0.41) and the highest in forest or grassland (more than 0.53). Proportion of migrants by land cover type confirms that migrants are more present in *rental landscape*[68].

6.1.1.5 Conclusion

The analyses performed above, comparing the land use of Agusan del Sur and the observed levels of marginality within the province, allows validating **hypothesis 1**: <u>plantations are associated with low marginality levels</u>. A set of features observed on the ground prove that the induced supplies (water and electricity supplies, infrastructure development, houses for employee[69], etc.) as well as the decrease of remoteness (transport infrastructures development) have *globally* a positive effect on the living standards of local populations. It is important to emphasize that the positive effect is observed at a *global level*, i.e. as an average at the scale of the village. However, within the same village, significant disparities are observed between sub-groups. For instance as employees of Plantation Company have access to water or electricity, non-employees have not such facilities.

> It is relatively easy to understand why today a large part of the province has benefited, directly or indirectly, from plantations. Commercial plantations were introduced in the province during the 60s. At this time of economic expansion, the demand for oil palm and forest products was increasing. In the 80s agro-forestry projects became very popular and the province benefited from the *plantation-induced supplies*[70]. The demand on world markets for oil palm has significantly increased since 2005 particularly due to the development of biodiesel production from palm oil but also due to an increased demand from the Chinese food industry booming (Bissonnette and Bernard, 2008). This favourable context in oil palm

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[67] This result concerns only two villages but several elements already mentioned show that towns and built-up areas are linked to low marginality.

[68] Rental landscape are considered here as the result of a market-oriented exploitation of land and natural resources.

[69] For instance in Maligaya, one of the surveyed villages, employees of FPPI get one house with access to electricity and water.

[70] The Pan-Philippines highway was constructed during the 60s led by the entry of forest-business. The development of towns (Bayugan, San Francisco, Trento) and infrastructures were largely induced by the plantations installed in Agusan del Sur (Filipinas Palm Oil Plantation (FPPI), Paper Industries Cooperation of the Philippines (PICOP)).

industry suggests that in the future more plantation-induced benefits will be generated.

While negative externalities have been also observed on both the natural environment (pollution, increased erosion, etc.) and some population groups (land tenure conflicts) – reported in the early 80s by Hontiveros (1988) –, the management of social concerns by plantation companies has often evolved, on average[71], to the advantage of employees.

Our analyses show that irrigated agriculture is moderately associated with low marginality and, in a sense, confirms **hypothesis 2**. Indeed, this farming system[72] may ensure a relative stability of production and therefore a substantial income.

Hypothesis 3 is rejected. Villages in close canopy areas have not higher marginality levels than villages in secondary forest areas.

Hypothesis 4 is accepted. Migrant proportion is important in built-up areas, plantations and irrigated agriculture areas. Moreover, we can notice that the highest marginality levels are associated with *remote natural environments*, which also have low proportions of migrants. This is not surprising because people maintaining a traditional lifestyle, often deprived of basic necessities, are increasingly confined to ancestral areas which are remote natural environments.

At this stage, it is not allow to accept or not **hypothesis 5**. Indeed, this hypothesis, a corollary of hypothesis 4, did not concern land use or environment and will be discussed in a next section.

6.1.2 Land Use Change, Marginality and Migration

After having validated (or counter-validated) the existing linkages between the Land use and Marginality/Migration indictors, we decide to explore the recent changes in Land Use, what will allow going deeper in the understanding of these linkages.

6.1.2.1 Literature

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[71] Certainly, dysfunction and oppression seem to still exist especially for certain groups of people (e.g. IPs). The study of such pressure by sub-population, while crucial, is not the purpose of this study.

[72] In the case of Agusan, irrigated agriculture is defined as a farming system using agricultural infrastructure of irrigation as well as drainage.

a. In-migration and LUC

As already mentioned in particular in Chapter 2, in-migration might significantly alter the land use and natural resources (Bilsborrow and DeLargy, 1991; Black and Sessay, 1997; Homewood *et al.*, 2004).

b. Degradation and marginality

An altered environment may induce a higher marginality (Duraiappah, 1998; Geist and Lambin, 2001). Indeed, faced with an altered environment in a given area (deforestation, loss of biodiversity due to the generalization of monocultures, fertility depletion, soil erosion, etc..), local companies as well as the local populations can not optimally exploit natural resources, and as a consequence can not generate surplus or usable outputs, which inevitably leads to increase the marginality. Studies highlighting land degradation[73] as causes of poverty are many (see especially Durraiappah, 1998 and FAO, 1999). This is most often intensified because the poor generally have access only to areas that have higher risk for health and income generation (IFAD, 1992).

Conversely, marginal situations may cause environmental degradation. For instance, poverty – specified i.a. in terms of several demographic, economic, technological and policy / institutional factors like low living standard, joblessness, extremely low income levels, social deprivation, marginalization, low empowerment of local user groups, etc. – has been reported as an underlying social process of deforestation in 42% of the cases studied by Geist and Lambin (2001, 2002). Mink (1993) suggests that, in an imposed short-time horizon context, poor farmers are less likely to make natural resource investments that give positive returns only after a number of years.

c. Forest regeneration and marginality

Forest regeneration (or *forest transition*[74]) may also have an impact on poverty levels. The forest regeneration may be accompanied by a reduction in poverty, by indirect effects (e.g. through a natural capital improvement) and the concomitant development

[73] Degraded land is considered as a land that has lost part or all of its productive capacity as a result of inappropriate human intervention. The min biophysical constraints are erosion, salinization, fertility depletion, lack of adequate drainage on soils and terrain prone to deterioration. The main socio-economic constraints are population pressure, land shortage, inadequate support to agriculture, lack of institutional framework, high cost of rehabilitation, lack of investment (FAO, 1999).

[74] Regeneration has to be associated to the *forest transition* phenomenon defined as the change from decreasing to expanding forest areas (Mather, 1992; Grainger, 1995). The causes of forest transition often mentioned are (i) the leave of the land from farm workers for better paying non-farm jobs or (ii) increasing prices of forest products inducing landowners to plant trees instead of crops or pasture grasses (Rudel *et al.*, 2005).

of programs of community forest management (Kumar *et al.*, 2000). But the potential impact of regeneration on the level of poverty is case-sensitive and often depends on the type of regeneration observed (Kumar, 2002; Rudel *et al.*, 2005; Lamb *et al.*, 2005). Conversely some poor rural communities may not see sufficient incentives to develop a regeneration (reforestation) for various reasons (land is needed for food production, land tenure insecurity, the fear to invest in an activity from which they may derive little benefit) (Lamb *et al.*, 2005). In this sense, marginality may be associated with low or absent forest regeneration.

6.1.2.2 Hypotheses

Aware of the literature findings, our field work and the provincial context, we formulate the following hypotheses for Agusan del Sur about the *land use change, marginality and migration*:

> *Hypothesis 6: Altered areas have experienced migration.*
>
> *Hypothesis 7: Altered areas have high marginality level.*
>
> *Hypothesis 8: Regenerated areas have low marginality level.*

6.1.2.3 Data and methods

Land use change in Agusan Del Sur is assessed through three methods and data:

- an analysis of *forest cover degradation* between 1987 and 2001 on the whole of the province (Fig. 6.3) based on satellite images (Berbers, 2007);
- the comparison of *Normalized Difference Vegetation Index* (NDVI[75]) measured in 1976 (April 17, Landsat MSS, spatial resolution : 80 m) and 2001 (May 22, Landsat TM, spatial resolution : 30 m)[76];
- the comparison of *high spatial resolution images* taken in 1979 by airborne and a satellite image taken in 2002 (July 25, QuickBird, spatial resolution : 0.6 m).

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[75] NDVI (Rouse *et al.,* 1974; Tucker, 1979) is an index used to assess – from a remote sensed image – if the target being observed contains live green vegetation or not. This index is calculate as follows: NDVI = (NIR-RED)/((NIR+RED) where RED and NIR stand for the spectral reflectance measurements acquired in the red and near-infrared bands, respectively. NDVI varies from -1 to +1. A zero means no vegetation and close to +1 indicates the highest possible density of green leaves.

[76] Note that the clouds cover rate of the first satellite image is of 40%.

Information from our field surveys, conducted in 2006 and 2008, will be also used here. Indeed, we asked during the interviews to key respondents – as Datu or Barangay Captain – if they notice, for their village, significant changes in Land Use, marginality level and possible migration causality.

The objective is to check if migration and/or marginality are correlated to certain land use change types. On the one hand, it is expected that the population pressure driven by an important in-migration have led to large clearing. On the other hand, the value of marginality for villages in deforested area will indicate if deforestation has improved or not the livelihood of local population.

6.1.2.4 Results

a. Forest cover degradation (1987-2001)

Based on the forest cover degradation map (Fig. 6.4), it appears that many areas have been deforested (orange areas) during the last two decades. Average values have been calculated for marginality (M) and endogenous marginality (M_{endo}) by forest cover type and degradation type (Tab. 6.5).

Forest Cover types and changes	Barangays concerned	Population	Number of migrants	% of migrants	Average Marginality	Average Endogenous Marginality
Secondary forest	23	16,674	9,740	58%	2.64	0.094
Deforestation	64	91,622	55,937	61%	0.08	0.002
Regeneration	4	3,828	2,379	62%	-1.53	-0.155

Table 6.5 – Basic statistics by forest cover type and forest cover change

Box 10 – Land Use Change at the provincial level

Massive deforestation experienced by the province is probably the most evident land use change during last century. This phenomenon has been already detailed previously in chapter 3 (box 5). Other types of land use change exist at the provincial level but statistics at the infra-provincial scale are very hard to get. The most accurate available data come from the agricultural censuses every decade since 1971 only at the provincial scale. With these data, it is possible to assess the evolution of different land uses (forest, agriculture, meadows, etc.) or activities and/or products (cereals, fruits, etc.). For example, the number of farms in Agusan del Sur grew double by 30.000 between 1971 and 2002 while the cumulated surface of farms was multiply by 4 during the same period. The crop planted area (temporary or permanent) tripled during this period in the province, increasing from about 60.000 ha. to more than 180.000 ha. Such statistics demonstrate a rising demand for land linked to significant land use changes. The identification of potential links between marginality and land use change required other type of data.

Out of the 91 barangays which are covered by the Berbers's forest cover comparison study, 64 are affected by deforestation, 23 are located in secondary forest and 4 experienced a regenerating environment. Certainly it is true that the geographical distribution of villages is not homogeneous and that there are more villages near the deforestation fronts. This is linked to the driving factors of deforestation in Agusan[77]. Statistics show that marginality is, on average, higher in secondary forest (2.64), lower in deforested area (0.08) and even lower in the regenerating area (-1.53). This report is to be put in parallel with the agro-silvicultural dynamics and highlights the role, already mentioned before, of remoteness on the level of marginality. Almost all of the 23 villages in secondary forest are remote from towns and – as a consequence – are less influenced by urban market and economy. Villages located in deforestation area have a lower marginality because their economy benefits from the forest products exploitation and from the development of modern farming. About the low marginality observed in regeneration areas, possible explanations are that the natural capital has increase there and give benefits to local populations or that these latter are involved in a reforestation program and are engaged in a sustainable management. No relevant results are observed for endogenous marginality.

[77] Deforestation in Agusan del Sur is performed mainly to develop agricultural activities or to expand commercial plantations. Such driving factors of deforestation lead to population colonization, which is not true in all regions where there are deforestation fronts. For instance, in Brazil, two thirds of tropical forest loss is attributed to commercial and speculative interest and no systematic population encroachment is observed (Moran, 1993; Degen, 2009).

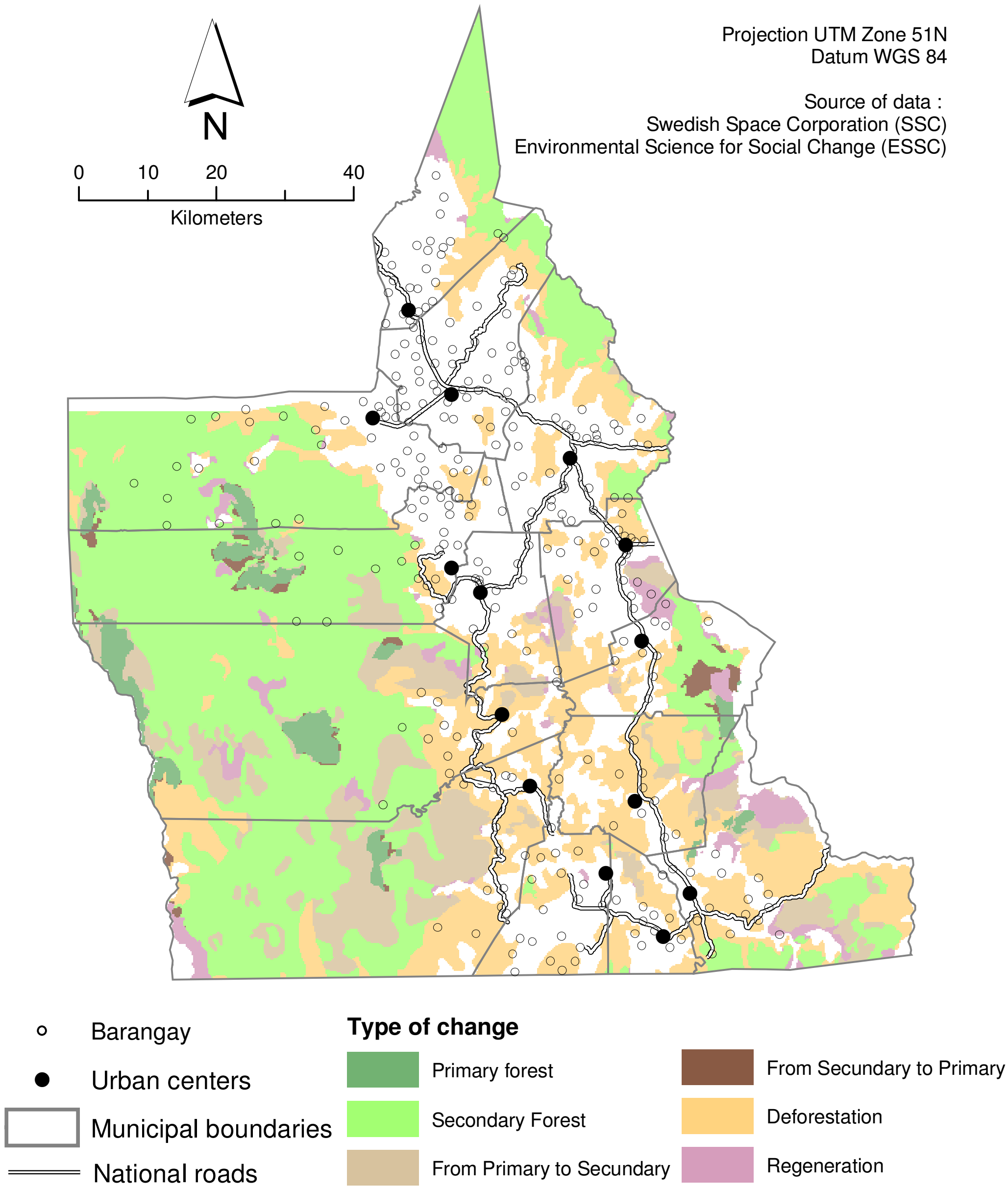

Fig. 6.4 – Forest cover comparison (1987-2001) in Agusan del Sur Province (adapted from Berbers, 2007)

b. NDVI change (1976-2001)

The mapping of NDVI allows us to identify areas that have experienced alteration of vegetation during the last thirty years. Figures 6.5*a* and 6.5*b* below present the NDVI change – NDVI observed in 2001 minus NDVI observed in 1976 – with regards of marginality index (*M*) and the proportion of migrants in 2005.

One can observe on figure 6.5*a* that villages with high marginality on the west side are located where NDVI has increased[78] (NDVI difference higher than 0.3). In fact these villages, located in closed or open canopy forests, are remote and far from alteration spots or alteration fringes (commercial plantations, periurban fringe, etc.). East side of the province should present higher alteration but any such observations are not possible due the clouds covering all the east part.

However it is more evident that alteration may also be caused by high proportions of migrants (Fig. 6.5*b*). In fact, one observes that the proportion of migrants is high where NDVI has decreased.

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[78] The observed increase in NDVI is not surprising because west side of the province is mainly covered by secondary forest (cf. Fig. 6.4) which has a significant biomass production.

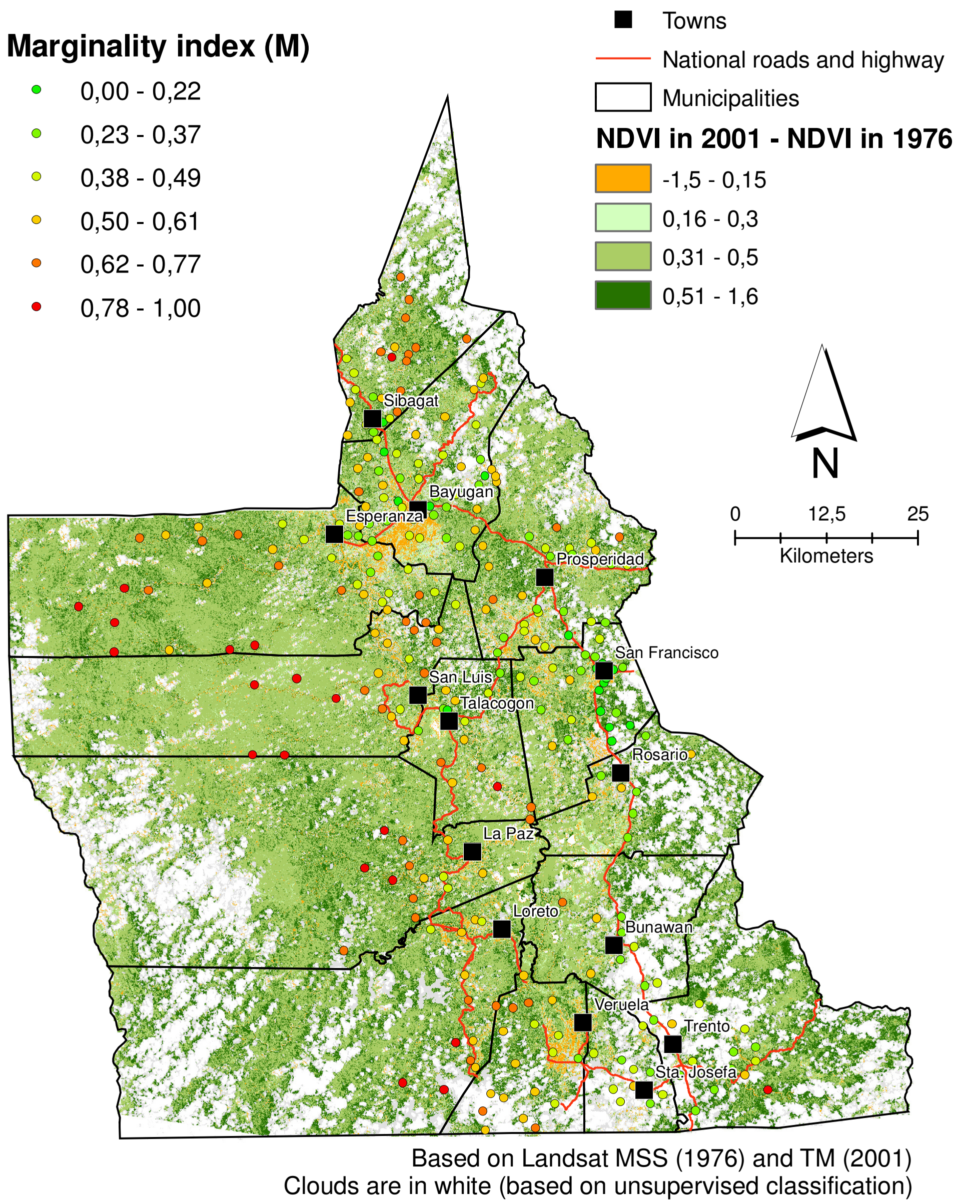


Fig. 6.5*a* – NDVI change (1976 – 2001) vs. marginality index
Agusan del Sur Province

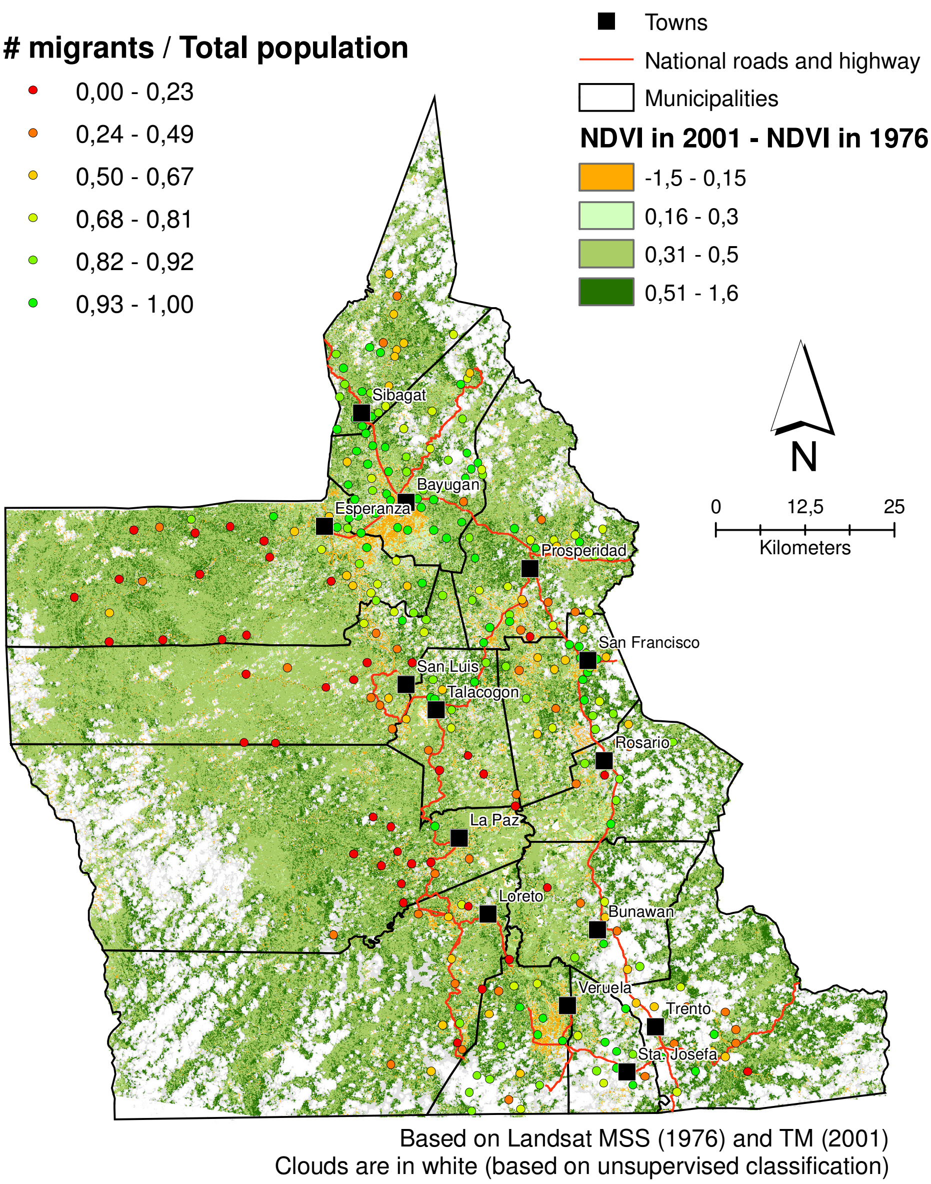


Fig. 6.5*b* – NDVI change vs. proportion of migrants
Agusan del Sur Province

Two areas have been sharply altered during the 1976-2001 period. These areas are mapped in orange on figures 6.5*a* and 6.5*b*. The villages covering and surrounding these two altered areas are characterized by (i) relative low marginality levels and (ii) high proportions of migrants.

The first one is located between Bayugan and Esperanza south of the river connecting these two towns. This alteration – translated by a NDVI diminution – corresponds in fact to the development of irrigated agriculture as shown below (Fig. 6.5*c*).

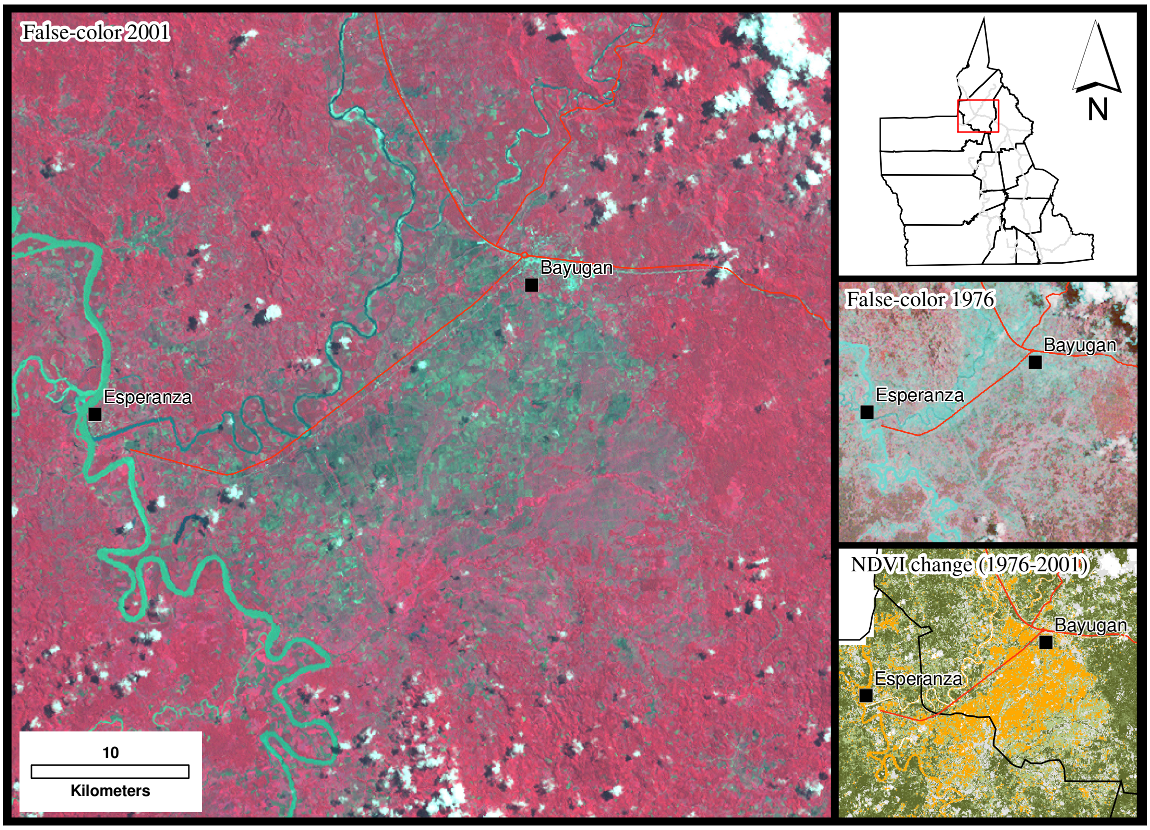


Fig. 6.5*c* – Alteration due to irrigated agriculture development close to Buyugan and Esperanza, Agusan del Sur Province

The second altered area is located south-west of Veruela south of the province (Fig. 6.5*d*). In this case also NDVI decrease seems to correspond to an agricultural development[79]. This agricultural development appears to be due to the relatively recent arrival of migrants. Indeed, according to NSO (National Statistics Office), the population of the municipality of Veruela almost doubled during the nineties (from 21,000 to 38,000 inhabitants). This demographic increase can be mostly explained by in-migration[80].

[79] In the case of Veruela, texture and structure of the image of 2001 do not correspond particularly to those observed in the case of an irrigated agriculture. Indeed, irrigated vegetations have often distinctive rectilinear spatial patterns (Haack *et al.*, 1998).

[80] Let us remind that the number of in-migrants in Veruela was estimated to 18,000 in 2007 (see Chapter 4 and annex 4).

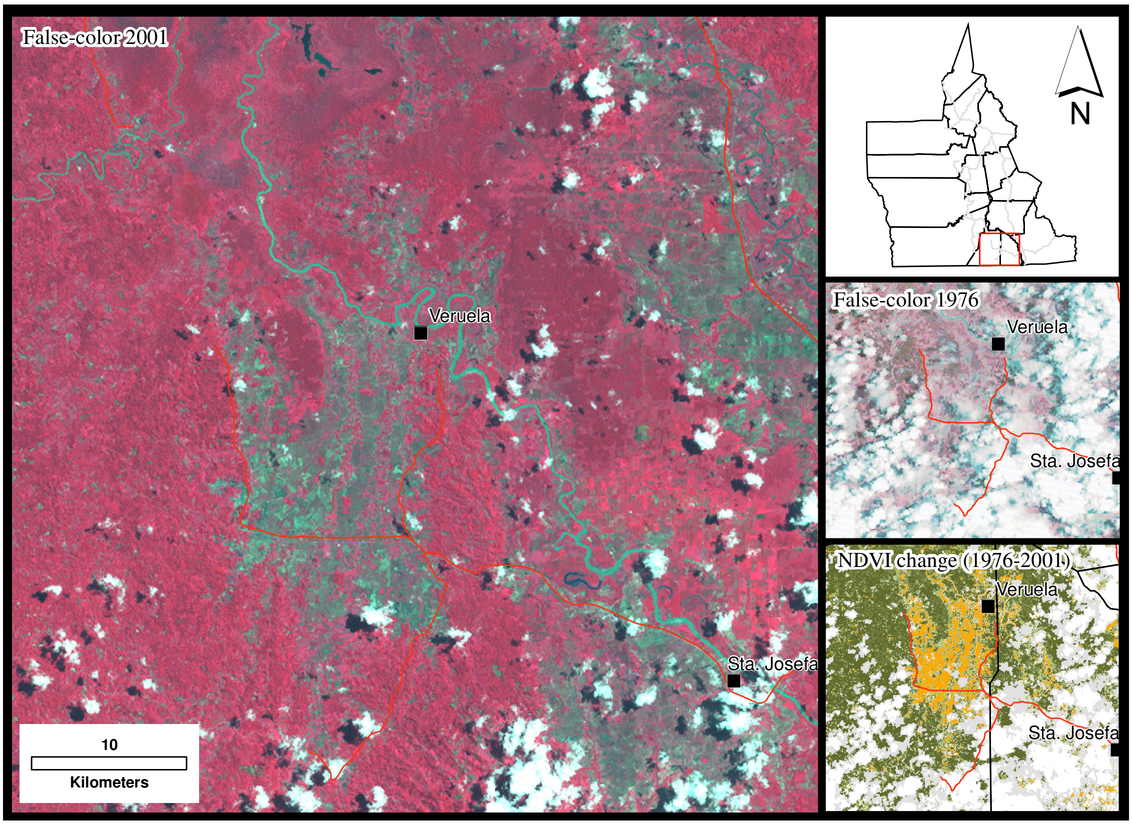


Fig. 6.5*d* – Alteration due to agriculture development close to Veruela, Agusan del Sur Province

c. High spatial resolution images comparison

The environmental alteration has been also brought to light from a comparison of panchromatic aerial images of Caimpugan (municipally of San Francisco) taken in 1979 and an image from Google Earth (Quickbird, 2002, July 27). Both images have a high spatial resolution (0.6 m for Quickbird, below for aerial photos). Figure 6.6 sets *vis-à-vis* the two dates and one sees clearly the forest withdrawal. This latter may be correlated with the population growth of the village and with the number of migrants. According to National Statistics Office, Caimpugan population doubled between 1990 and 1995, from 507 to 1,257, which can be reasonably understood by an important influx of migrants over the same period. The number of in-migrants (non-IPs) to Caimpugan in 2005 is estimated at 654 (CBMS, 2005). The marginality index (*M*) in Caimpugan is 0.58 (rank 85/283, provincial mean: 0.49).

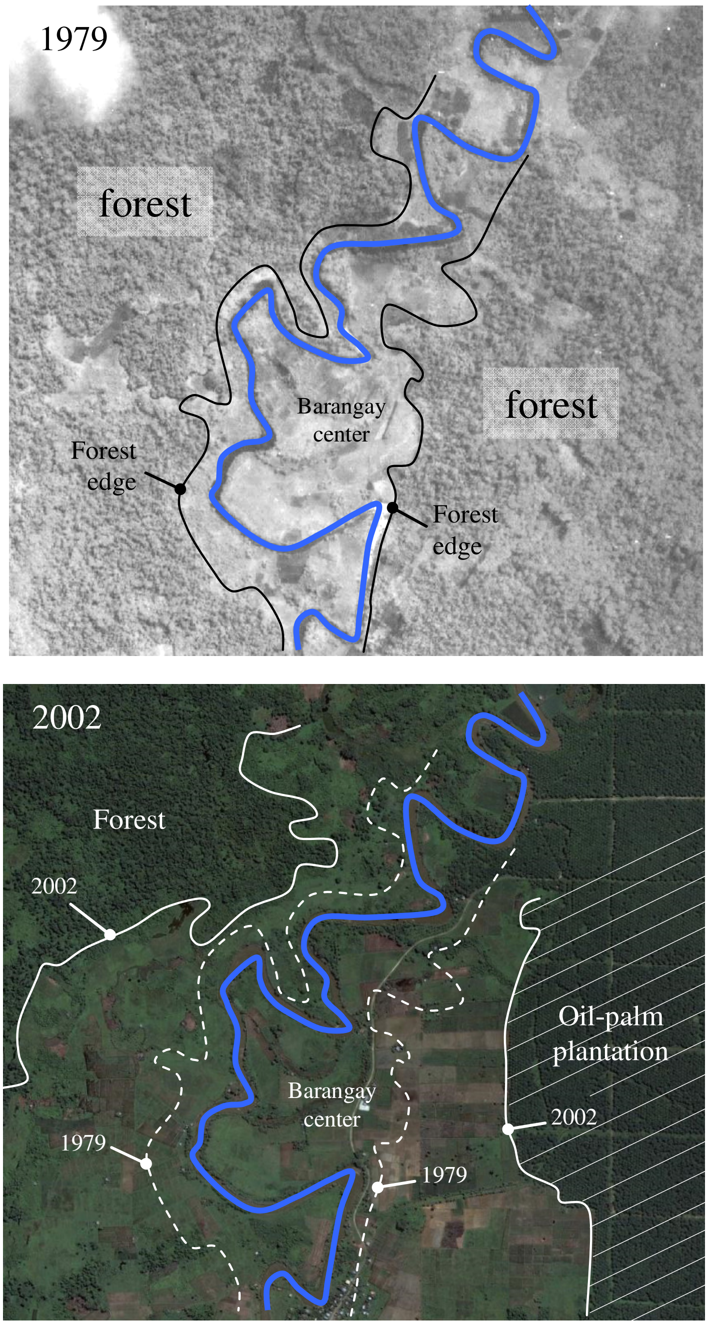


Fig. 6.6 – Forest withdrawal between 1979 and 2002
(Caimpugan, Municipality of San Francisco, Agusan del Sur Province)

d. Field survey

The field surveys we conducted in 2006 and 2008 give us some features confirming that migrants have had an impact on the local environment (deforestation/clearing in particular). This is suggested by the following recurrent excerpts from our interviews: "since the migrant came into the area land was cultivated and the area became bigger and bigger", "the change when migrant came in the area, land cultivated became wider", "migrants squatted our land and driven away by migrants because we have no education and knowledge about the legality of the land", "before there was forest, now it is very cleared", "before the land was very fertile and we had big harvest, not now". However, in some cases, environmental impact is *not strictly due to the arrival of migrants itself* – although concomitant – but more by the nature of the economic activity in which they are hired. For instance, the arrival of migrants may be motivated by the implementation of plantation companies (e.g. oil palm plantation in Maligaya) which are often responsible for widespread deforestation that degrades important ecological services (Wakker, 2005; Fitzherbert *et al.*, 2008).

6.1.2.5 Conclusions

Hypothesis 6 is accepted: altered areas are the ones that have experienced migration. While Land Use Change analysis between 1987 and 2001 did not show clearly significant difference in the proportion of migrant between secondary forest areas, regeneration areas and deforestation areas, NDVI change analysis between 1976 and 2001 shows that significant NDVI decreases are observed where migration rate are high. The images comparison in Caimpugan (1979-2002) confirms these results.

Hypothesis 7 *(Altered areas have high marginality level)* is not accepted. Indeed, Land Use Change analysis between 1987 and 2001 did not allow confirming this hypothesis. Areas for which we have results are *secondary forest*, *deforested areas* and *regeneration areas* which are all three considered as altered. Their levels of marginality are very different. In addition, we lack of data about *non-altered* areas to compare with *altered* areas and to take a clear position. We would even be tempted to assert the opposite of the hypothesis (i.e. *altered areas have low marginality level*) given the NDVI change analysis (low marginality levels close to areas having experienced NDVI decrease).

Hypothesis 8 is accepted: regenerated areas have low marginality level. Indeed, we observe higher marginality level for deforestation areas than for regeneration areas.

In conclusion, this suggests once more that in-migrants, dealing environmental pressures through their activities, have played a major role in the start of a local economical dynamism.

6.1.3 Tenurial instruments, Marginality and Migration

Existing links between marginality, migration and Land Use/Land Use Change are emphazieed through our previous analysis. Management programs may constitute pull or push factors for migration and have often a strong influence on the access to land. As local population's activities, in particular farming and agro-forestry, are constrained by tenurial instruments, we decide to explore possible *tenurial instruments – marginality/migration* linkages.

6.1.3.1 Literature

The literature reports many influences between management programs – like tenurial instruments[81] – and poverty. Resource management can go hand-in-hand with poverty alleviation in particular with participative management approaches (Kerr *et al.*, 2000; Kumar, 2002; Altieri, 2002). However, profits may vary between populations and locations (Kellert *et al.*, 2000; Kumar *et al.*, 2000).

In the Philippines, tenurial instruments are often implemented by the Department of Environment and Natural Resources (DENR). A description of these instruments is given in table 6.6. Figure 6.7 presents the tenurial instruments covering the province of Agusan del Sur. *People-oriented forestry* programs emerge during the 1980s and the 1990s shifting the emphasis from the traditional approach of 'getting the trees on the ground' to 'getting the livelihoods of the people off the ground', through the involvement of local populations (Pulhin *et al.*, 2006).

However, the performance of people-oriented programs such as CBFM (Community-Based Forest Management) and CBRM (Community-Based Resource Management) – both designed to reduce rural poverty – are often limited (Harrison *et al.*, 2004). A lack

[81] In the Philippine context, *tenurial instruments* are agreements or special land managements assigned to an area.

of governmental support often leads to *illegal logging* and a source of frustration among stakeholders (Emtage, 2004; Tarun-Acay, 2004). Moreover, the duration of property rights – in particular in Industrial Forest Management Agreements (IFMAs) and CBFM – seem to present some concern to smallholders: “the present tenurial systems do not assure stakeholders and investors of a long-term or semi-permanent arrangement. The present systems can accommodate one-cutting, possibly two-cutting systems only” (Bernas, 2000, as quoted by Saastamoinen, 2001, p.99). Resource management programs – in particular CBFM – have been criticised for regarding ‘communities’ as largely homogenous components, neglecting the intra-community disparities that exist (Pulhin, 1999; Olsson and Knudsen, 2004).

Therefore it appears that the impacts of management programs are very diverse and multi-scalar. Some may be beneficial for the national economy but bad for local people. Others may increase the natural capital but decrease the local cultural capital. It depends somewhat on the level of integration of each part.

Tenurial Instrument	*Description*	
IFMA	Industrial Forest Management Agreements	Rehabilitation, protection, improvement and management of natural forests by qualified organisations with the incorporation of communities in the overall management
CBFMA (Previously CFMA)	Community-Based Forest Management Agreements	Rehabilitation, protection and management of Fragmented Natural Forests by communities
CADC	Certificates of Ancestral Domain Claims	Protection and management of indigenous peoples' claims – alienable and disposable areas, public lands with or without forests
TLA	Timber License Agreements	Long term (25 years) logging license.
TLA within CADC	TLA within CADC	
CSC	Certificate of Stewardship Contracts	A document issued by the government to qualified individual forest occupants pursuant to Stewardship Agreement (SA). A Stewardship agreement is a 25-year contract entered into by and between an individual forest occupant or forest community association, or cooperative and the government allowing the former the right to peaceful occupation, possession, and sustainable management over the designated area.
FLMA	Forestland Management Agreement	A contract bet. The DENR and Forest Land Manager (FLM) which grants the sole and exclusive privilege to the FLM to occupy, develop, and manage the land specified in contract for a period of 25 years, renewable for another 25 years.
CFMP	Community Forest Management Plan	A 25 year agreement (renewable for another 25 years) which grants forest products utilization privileges to the community residents
Others		
Open Access	Open Access	Forest areas that are not under any kind of management, where anybody can come in and out to exploit the resources
Civil Reservation	Civil reservation	Forestland that have been proclaimed by the President of the Philippines for a specific purpose such as Townsites, Resettlement Areas, Ancestral Lands, etc.

Table 6.6 – Description of main tenurial instruments within the Philippines

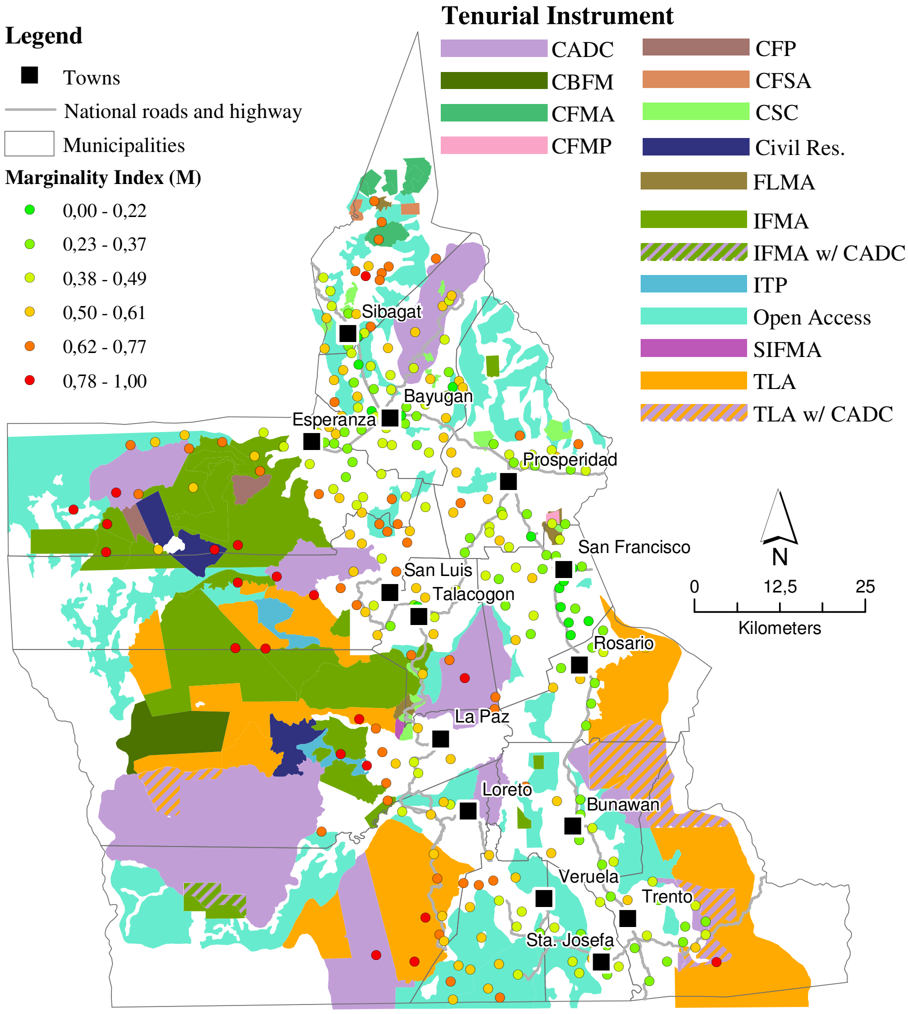


Fig. 6.7 – Tenurial instruments vs. marginality in Agusan del Sur (source: DENR)

6.1.3.2 Hypothesis

It is relatively difficult to expect the impacts on marginality of existing management programs in the province of Agusan del Sur. Keep in mind that a bias exists in practice since most plans are in forest areas which are home to the most remote populations, most of which have a high degree of marginality. It is expected that the exploitation of natural resources with non-community-based tenurial instrument has less positive fallout on local populations. Therefore, we formulate the following hypothesis:

Hypothesis 9: Villages covered with non-community-based agreements (like TLA, IFMA, FLMA) have a higher marginality.

6.1.3.3 Data and methods

In order to assess the possible influences of tenurial instruments on the marginality level, we use coverage from the Department of Environment and Natural Resources (DENR). The overlapping and cross-comparison of tenurial instrument coverage and marginality level allows identifying possible spatial correlation.

6.1.3.4 Results

Only 42 villages are concerned by tenurial instruments. Some tenurial instruments are covered by only one or two villages and statistic are no significant for these. Average marginalities and proportion of migrants by tenurial instruments – with a sufficient number of villages – are given in table 6.7[82].

Tenurial Instrument	*# of villages*	*%*	*Population*	*M (average)*	*M_{endo} (average)*	*Proportion of migrants*
IFMA	11	31%	10,316	0.76	0.12	0.15
TLA	8	22%	12,148	0.69	0.15	0.55
TLA within CADC	2	6%	3,172	0.67	0.11	0.44
CADC	15	42%	12,913	0.64	0.04	0.47
Total	*36*		*38,549*			

Table 6.7 – Average marginalities, proportion of migrants and population by type of tenurial instruments

Villages covered by Industrial Forest Management Agreement present higher marginality (0.76) – and fewer migrants[83] – than villages covered by Timber License Agreement (0.69), TLA in CADC (0.67) and CADC (0.64). We do not attempt here anymore interpretation, by lack of sufficient information about such tenurial instruments and their implementation context. Therefore, it is not possible to accept or reject **hypothesis 9**.

[82] In the table 6.4 we distinct TLA and TLA within CADC to test a potential influence of CADC on results.
[83] Industrial forestry activity is however often known as an attractive activity of migrants.

6.1.4 Environmental factors: conclusions

It appears that some links exist between marginality, migration and environment (land use and land use change). The analysis shows that anthropic environments (irrigated areas or regeneration areas) are associated with a lower marginality, this being mainly due to the main activities associated with such environments (plantations, logging, agriculture). The most preserved forested areas (open canopy, secondary forest) are correlated with higher marginality levels. Most villages having experienced less migration and having maintained a more traditional lifestyle are found in these areas. The analysis of vegetation index changes and in addition shows very clearly two alteration areas of the primary forest cover. These changes are the result of migrants' influxes and a concomitant farming development. Finally, this analysis does not allow identifying any influence of tenurial agreements on the level of marginality.

The analysis suggests, but can not formally prove the existence of a *migrant-induced economic dynamism*. At this stage, it is difficult to identify if this possible effect is not due to the sole population size. Indeed, migration and population are correlated. In order to quantify their influence on marginality and their internal redundancy, further analyses have to be performed, what we do in the next section.

6.2 Demography-marginality nexus

In this section, we endeavour to identify what demographic factors, such as the population size or the proportion of in-migrants, might explain or be explained by the marginality level, for the literature review identifies population as well as migration as intimately linked to development mechanisms. Then we conduct multiple multivariate regressions in order to assess demography-marginality interlinkages.

6.2.1 Literature

a. Population size and population growth effect

The influence of the population (size and/or growth) on the level of development is quite controversial in the literature. This lack of consensus comes from the fact that the benefits associated with a large population or population growth depend heavily on local context. While some authors suggest that population growth increases poverty (van de Walle, 1985, Mauro, 1995; Kelley and Schmidt, 1995; Barro, 2001), others conclude that population growth contributes to economic development (Johnson and Lee, 1987). Whatever the population growth seems clearly influence the level of poverty. This influence can be more or less indirect (changes in access to education and health services, changes in the size and structure of families, etc.) as suggested by Ahlburg (1996).

b. Migration effect
A *migration effect* is reported in many cases to be of grand influence on the marginality of the receiving villages as also mentioned in chapter 2 (section 2.1.3*c*). As the in-migrants come mainly from rural areas (Cruz *et al.*, 1988; Jimenez and Sotto, 2004), the arrival of migrants in rural areas may modify positively the intensity of agriculture – through for instance the implementation of new technologies or the creation of cooperatives. In a first time at least in-migration may reduce the marginality level. In the case of in-migrants retaining the same activity than at their origin place, competition between migrants and resident populations may occur (Campbell *et al.*, 2000; Doevenspeck, 2004). Pressure increases when the number of farmers significantly increases and the size of farms decreases. The links between population and intensive agriculture have been widely studied in the literature since the work of Malthus in 1798 and Boserup in 1965. For instance, the population density may have a positive effect on cropping intensity and play a major role in increasing intensification of land use (Mishra, 2002). In the same way, in-migration in rural areas may induce a change in employment patterns such as the emergence of non-farm jobs in rural areas and diversification of activities (Peker, 2004). Whatever, the significance of in-migration contribution to poverty and marginality is far from clear.

6.2.2 Hypotheses

In Agusan del Sur, we can expect to observe a negative correlation between marginality and population size. In other words, we think that populous areas have led to the development of local infrastructures and services which has reduced the level of marginality. The population growth being largely due to in-migration as confirmed in Chapter 4, we suggest that in-migrants generate economic development and therefore we expect a negative correlation between in-migration and marginality. This *in-migrant-induced development* has been already introduced through hypothesis 5.

Hypothesis 10: Population size is negatively correlated to marginality level.

Hypothesis 11: High in-migrants proportion is associated to low marginality level.

6.2.3 Data and method

In order to estimate the influence of population and migration on the marginality level (*M*), we proceed to an Ordinary Least Square (OLS) regression at the provincial level. Explanatory variables that we use are the following: (i) the natural logarithm of remoteness (Ln(R)), (ii) the natural logarithm of population size[84] (Ln(POP)) and (iii) the proportion of in-migrants (P(MIG)).

6.2.4 Results

A first model (see chapter 5, equation 5.7) expressed marginality as a function of the natural logarithm of the spatial isolation:

$$M = 0.0754 \text{ Ln(R)} + 0.1224 \qquad (6.1)$$

This model explained 44% of the observed variance.

In a second model (6.2), we introduce the logarithm of the population, reflecting 48% of the variance:

$$M = 0.059 \text{ Ln (R)} - 0.069 \text{ Ln(POP)} + 0.695 \qquad (6.2)$$

This model teaches us, compared to model 6.1, that the population size would imply on average a slight decrease of the marginality level.

In a third model (6.3), instead of introducing the logarithm of the population, we introduce the proportion of migrants as explanatory variable. This model reflects 59% of the variance:

$$M = 0.061 - 0.002 \text{ P(MIG)} + 0.354 \qquad (6.3)$$

---

[84] Natural logarithm of population size is a standard measure used in analyses of the relationship between population growth and economic development (Bloom and Freeman, 1987). More concretely, we use the natural logarithm because we assume here that the effect of population size is dwindling with the size of the population. For lack of data, we did not use *sensu stricto* 'population growth' as an explanatory variable. Indeed, population growth values are not available at sub-provincial level.

We see here that on the one hand the proportion of migrants in each village explains the marginality level further than the sole population and secondly that the proportion of migrants reduces the marginality but to a lesser extent than the population size (0,002 <0.069). This suggests the existence of a demographic structural effect.

Finally, we build a fourth and last model (6.4) where remoteness, population size and proportion of migrants are all taken as explanatory variables. This model then explains 63% of the total variance:

$$M = 0.048 \text{ Ln(R)} - 0.060 \text{ Ln(POP)} - 0.002 \text{ P(MIG)} \qquad (6.4)$$

Here, remoteness increases the marginality level while population and migration jointly reduce it. Moreover, the *migrant effect* on marginality appears stronger than the *population effect*[85].

Two classical regression procedures (*best model* and *stepwise regression*) give this latter model the best one among the three.

OLS regression results of model (6.2), (6.3) and (6.4) are summarized hereafter (Table 6.8).

[85] Indeed, we calculate also the beta coefficients for our regression models (see table 6.8). Such coefficients – also called standardized coefficients – are used to compare the relative weights of the variables. The higher the absolute value of a coefficient, the more important the weight of the corresponding variable. In our case, the beta coefficients indicate that the marginality is primarily a function of (i) the remoteness (they increase together) then (ii) the proportion of migrants (whose the increase is concomitant with a decrease of the level of marginality) and finally (iii) the population (whose size varies inversely with the marginality).

Model 6.2	*M=f(R,POP)*		*R^2 = 0.48*		
	Value	Standard error	t	Pr > |t|	Beta coefficients
Intercept	0.695	0.111	6.285	< 0,0001	
LN(R)	0.059	0.006	10.327	< 0,0001	0.519
LN(POP)	-0.069	0.013	-5.288	< 0,0001	-0.266
Model 6.3	*M=f(R,MIG)*		*R^2 = 0.59*		
	Value	Standard error	t	Pr > |t|	Beta coefficients
Intercept	0.354	0.032	11.007	< 0,0001	
LN(R)	0.061	0.005	13.248	< 0,0001	0.536
P(MIG)	-0.002	0.000	-10.057	< 0,0001	-0.407
Model 6.4	*M=f(R,POP,MIG)*		*R^2 = 0.63*		
	Value	Standard error	t	Pr > |t|	Beta coefficients
Intercept	0.842	0.095	8.823	< 0,0001	
LN(R)	0.048	0.005	9.468	< 0,0001	0.418
LN(POP)	-0.060	0.011	-5.392	< 0,0001	-0.233
P(MIG)	-0.002	0.000	-10.079	< 0,0001	-0.390

Table 6.8 – Marginality as a function of remoteness, population and migrants (Agusan del Sur Province)

Consequently, these statistical results confirm **hypothesis 10**: <u>population size is negatively correlated to marginality level</u> as well as **hypothesis 11**: <u>high in-migrants proportion is associated to low marginality level</u>. Finally, these results support hypothesis 5: <u>migrants have induced locally an economic dynamism leading to low marginality levels</u>.

6.2.5 Conclusion

Three levels of factors play crucial roles in global marginality level: remoteness, migration and population. These three factors explain a large part of the observed villages' marginality. The regression analysis which we made shows that the remoteness increases the level of marginality and that migrants' presence as well as the density of population decreases it. These statistical results suggest, rather obviously, the existence of a *demographic effect*. However, the intensity of this effect can be explained – *in situ* – by several elements or facilitating mechanisms. So for instance the presence of agricultural infrastructures, the existence of cooperatives or efficient services may facilitate locally the impact of a large human capital on the development level. Furthermore, others determining factors of marginality may exist besides remoteness, the presence of migrants and the size of population. This leads to a necessary investigation of a wider panel of potential socio-economic explanatory factors.

6.3 Socio-economic explanatory factors

The objective of this section is to identify explanatory factors of marginality other than the environmental and demographic ones. Correlation analysis at provincial and municipal level between potential explanatory factors and marginalities is performed in a first time. In a second time, we use a local indicator and finally a correspondence analysis to identify local peculiarities.

6.3.1 Literature

Besides the links between population, environmental, migration and marginality already reported above, the literature also refers to certain items as being – if not the cause of situations of marginality – at least related to this situation. Thus, several studies at the household level show strong links between poverty and the assets[86], the activities or the material goods (basic needs and consumer durables) etc. Some of the main expected linkages are given below (Table 6.9).

Findings	Authors
Agriculture	
Modernization in agriculture (farm machinery usage per capita and fertilizer usage per acre) have highly significant positive impacts on individual consumption growth rates	Jalan and Ravaillon (1997)
Emerging *off-farm activities*[87] is a way to get out of poverty.	Taylor (1981[88]); FAO (1999); van de Walle and Cratty (2004); Man and Sadiya (2009)

[86] Assets are considered as stocks of directly or indirectly productive factors that produce a stream of cash or in-kind returns. Common examples include bank deposits, human capital land, livestock, machinery, stores or transport equipment (Barrett and Reardon, 2000). Reardon and Vosti (1995) even proposed the concept of "asset poverty" distinct and complementary to the classic concept of "income-poverty." Numerous studies now adopt an *asset-based approach* (see Carter and Barrett, 2005).

[87] As defined by Man and Sadiya (2009), *off-farm* work participation is defined as the participation of individuals, whether they own their land or work for a wage, in a secondary or additional job away from his or her own plot of land. Off-farm activities are (a) primary activities in the non-agricultural sector, and (b) secondary activities in either the agricultural sector (for example, a secondary job at a fish farm, either self-owned or for wages) or the non-agricultural sector (for example, a secondary job in transportation or at a retailer, or a farm household member who owns a barber shop or works as a vendor).

[88] Mentioned by Man and Sadiya (2009)

Findings	Authors
Off-farm activities to be most important to the poorest and richest	van de Walle and Cratty (2004)
Irrigation brings a range of benefits to individuals and households	Shah (1993); Hussain and Hanjra (2004)
Technology-oriented agricultural projects have largely failed to significantly contribute to broad-based poverty reduction.	PPLPI, 2008
Sustainable agriculture can result in improvements in livelihoods for landless families and the core poor in three ways: improvements to labor markets, improved access to land through land reform, or changed social norms that encourage greater equity and sharing.	Pretty and Hine (2001)
Livestock	
Livestock has a positive impact on household income (case in Vietnam)	Maltsoglou and Rapsomanikis (2005)
Livestock may be considered as a production factor.	Barrett and Reardon (2000)
Often the poor have small animals, not cattle. Poultry is one of the few assets that poor households have.	Dolberg (2001)
More than half of extreme poor are estimated to fully or partially depend on livestock for their livelihoods.	ILRI (2002) *in* Otte *et al.* (2009)
Migration	
Livestock can be important to migrants (case in India).	Deshingkar and Start (2003); Rao *et al.* (2006); Deshingkar *et al.* (2008);
Labor-intensive manufacturing, construction and services in rural areas are attracting large numbers of migrant workers.	Deshingkar (2006)
Others	
Possessions of consumer durables (television, radio, and motorbike) are linked to high income.	Minot *et al.* (2000)
Basic needs and consumer durables accounts for 60 percent of remittance expenditure.	Stahl and Arnold (1986)

Table 6.9 – Poverty, assets, activities and material goods: reported links

6.3.2 Hypotheses

For Agusan del Sur Province, we formulate the following hypotheses about agriculture and livestock:

Hypothesis 12: Secondary and tertiary sectors, including off-farm activities, are associated to low marginality level.

Hypothesis 13: Secondary and tertiary sectors activities have attracted in-migrants inducing a local economic dynamism.

Hypothesis 14: Modern agriculture is associated to low marginality level.

Hypothesis 15: Livestock constitutes a real livelihood factor.

Hypothesis 16: High marginality is associated to small animals, including poultry.

Hypothesis 17: Low marginality is associated to the possession of cattle.

6.3.3 Data and method

In order to identify possible explanatory factors of marginality other than the environmental and demographic ones, we carry out correlation analyses between selected socio-economic variables (having a possible relationship with marginality level in the light of the literature review) and the marginality indices (M and M_{endo}). The selected socio-economic variables are called PEF hereafter for Potential Explanatory Factors (annex 11).

Firstly, we work at the provincial level. This scale of analysis allows us to identify some *provincial factors of marginality*. As the socioeconomic variables studied here are not homogeneous within the province of Agusan del Sur, we also work at the municipal level[89]. This finer scale of analysis allows us to identify other factors specific to the municipality (*municipal factors of marginality*).

Factors identified at the provincial and municipal levels both provide additional elements for understanding the factors of marginality, their structures and the potential effect of hierarchy. Indeed, different patterns and causal forces may operate at different scales (Abler *et al.*, 1971; Pigozzi, 2004). For instance Pigozzi (2004) in a study of the marginality in Michigan (USA) shows that at the *macro scale*, the Hispanic population of Michigan is associated with more affluent urban regions rather than the low-density, poor interior while at the *micro scale* The Hispanics are associated with poorer, inner-city neighbourhoods. Mehretu *et al.* (2000) define theoretical structures of spatial marginality and identify scale-specific (mega, macro, micro, and in situ level) causal mechanisms (see Chapter 2, Section *2.2.2.1*). For

[89] This approach is inspired by Geographically weighted regression (GWR) commonly used to overcome the limitations caused by spatial dependency (Miron, 1984, quoted by Fotheringham *et al.*, 2002).

methodological reasons we focus in this section at the meso and micro levels[90] (Fig. 6.8).

It is emphasized that our goal here will not be to model the marginality but to analyze the PEF-marginality correlations to identify on the one hand (i) any provincial or municipal factors of marginality and on the other hand (ii) signals of a potential effect of hierarchy.

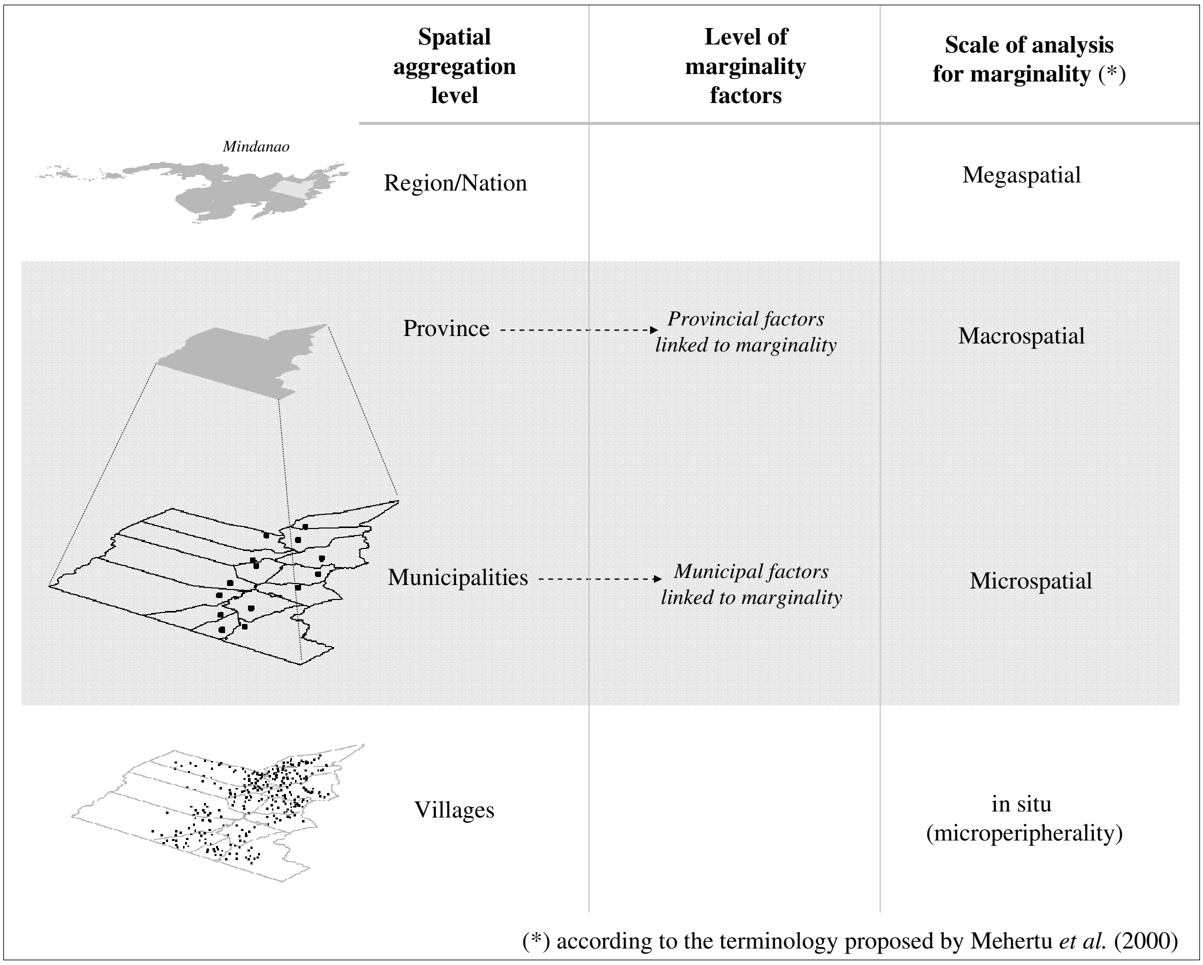


Fig. 6.8 – Macrospatial and microspatial scales used for correlation analyses

[90] The analysis of marginality at a *mega scale* goes beyond the scope of this study. About the analysis of marginality at *in situ scale*, that is to say at the village level, the correlation analysis is inherently not possible, the village being the basic unit in the database. However analysis at in situ scale (also called *microperipherality*) has been previously done through the analysis of the neighbouring environment.

6.3.4 Results

6.3.4.1 Correlation at provincial level

Significant correlations between potential explanatory factors (PEF) and marginality (*M*) at provincial level are given in the tables 6.10 to 6.13. The main findings are presented below.

a. *Sectoral differentiation and the role of off-farm activities*

As mentioned in the introduction of this section, several authors find in other Asian countries, that tertiary and secondary activities and off-farm activities often have a positive impact on livelihood. In the case of Agusan del Sur also we find that activities like services[91], construction and manufacturing are inversely correlated to the level of marginality while positive correlations are found for traditional activities like crop farming & gardening and fishing[92].

		r (Pearson)		
Code	Description	M		*P_MIG*
P_CROPFGAR	% of HHs engaged in crop farming and gardening	0.72	***	*-0.29*
P_FORESTRY	% of HHs engaged in forestry	0.41	***	*-0.19*
P_FISHING	% of HHs engaged in fishing	0.27	***	*-0.35*
P_POULTRY	% of HHs engaged in poultry and livestock raising	0.15	**	*0.06*
P_MINING	% of HHs engaged in mining and quarrying	-0.19	***	*0.05*
P_CSPSERV	% of HHs engaged in CSP services	-0.24	***	*0.21*
P_MANUF	% of HHs engaged in manufacturing	-0.24	***	*0.07*
P_CONSTRUC	% of HHs engaged in construction	-0.34	***	*0.21*
P_TRANSCOM	% of HHs engaged in transport and communication	-0.55	***	*0.35*
P_RETAIL	% of HHs engaged in wholesale and retail trade	-0.56	***	*0.42*

significance level : *** : p< 0.01 ; ** : p < 0.05

Table 6.10 – Correlation between *activities and marginality* and corresponding correlations with the proportion of migrants

We observe also that traditional activities are more correlated to IPs while services, construction and trade seem to attract more the migrants.

According these results, **hypothesis 12**: <u>secondary and tertiary sectors, including off-farm activities, are associated to low marginality level</u> and **hypothesis 13**:

[91] % of HHs engaged in transport and communication, % of HHs engaged in Community Service Project (CSP)

[92] There is a positive correlation between M and the proportion of HHs engaged in forestry but the meaning of “being engaged in forestry” being fuzzy we do not use this result.

secondary and tertiary sectors activities have attracted in-migrants inducing a local economic dynamism may be reasonably accepted.

b. Agricultural infrastructures does matter

Agricultural infrastructures (irrigation projects, agro dealers, mechanical driers, hand tractors, solar driers, mini-warehouses, etc.) are significantly negatively correlated to marginality but less (-0.49 < r < -0.16). This confirms that such agricultural infrastructures and services play a real productive function, help to increase income and are one of the ways to go out of marginality. However, some agricultural infrastructures like corn shellers, small farm reservoirs (SFR), corn mills and small water impounding projects (SWIP) are directly correlated to marginality. A possible explanation would be that corn sheller or corn mills are more financially accessible than irrigation projects, mechanical driers or than the building of a ware-house. As a result, these infrastructures are found in the more marginalized villages. SFR like SWIP are projects focussed on the poorer areas[93] (Nakamura and Balderama, 1998).

		r (Pearson)		
Code	Description	M		*P_MIG*
CORNSHELL	Corn Sheller (#/municipal population in 2000)	0.33	***	*-0.34*
SFR	Small Farm Reservoir (SFR) (#/municipal population in 2000)	0.22	***	*-0.32*
CORNMILL	Corn Mill (#/municipal population in 2000)	0.19	***	*-0.09*
SWIP	Small Water Impounding Project (#/municipal population in 2000)	0.13	**	*0.05*
FISHPOND	Fishponds distributed (No./municipal population in 2000)	-0.16	***	*0.00*
MINIWH	Mini-warehouse / Bodega (#/municipal population in 2000)	-0.16	***	*0.28*
SOLARDRIER	# of solar driers/municipal population in 2000	-0.29	***	*0.19*
MECHDRIER	# of mechanical driers/municipal population in 2000	-0.33	***	*0.37*
HANDTRACT	# of hand tractors/municipal population in 2000)	-0.43	***	*0.13*
AGRODEAL	# of agrodealers/municipal population in 2000	-0.45	***	*0.29*
P_IRRIG	% of municipal area served by irrigation projects	-0.49	***	*0.27*

significance level : *** : p< 0.01 ; ** : p < 0.05

Table 6.11 – Correlation between *agricultural infrastructures and marginality* and corresponding correlations with the proportion of migrants

These results lead us to accept **hypothesis 14**: modern agriculture is associated to low marginality level. Moreover we notice here that a link between the proportion of migrants and *modern agriculture* seems to be more manifest.

[93] These programs aim "to accelerate rural development through the adoption of on-farm reservoir technology, and to boost farm income by intensifying land use in rainfed areas" (Maglinao, 1994 *in* Nakamura and Balderama, 1998, p.40).

c. Livestock

The correlation between cattle and marginality is not strong, as well as with the proportion of HHs engaged in poultry and livestock raising (r = 0.15 both). The livestock the more correlated to marginality are carabao (water buffalo) and goat (r ~ 0.30). Swine and ducks are even less correlated to marginality (r = -0.20) (table 6.12).

Code	Description	r (Pearson) M		*P_MIG*
CARABAO	Carabao (#/municipal population in 2000)	0.30	***	*-0.28*
GOAT	Goats (#/municipal population in 2000)	0.28	***	*-0.35*
HORSE	Horses (#/municipal population in 2000)	0.19	***	*0.12*
CATTLE	Cattle (#/municipal population in 2000)	0.15	**	*-0.13*
P_POULTRY	% of HHs engaged in poultry and livestock raising	0.15	**	*0.06*
TURKEY	Turkeys (#/municipal population in 2000)	0.15	**	*-0.29*
DOG	Dogs (#/municipal population in 2000)	0.12	**	*-0.06*
SWINE	# of swines/municipal population in 2000	-0.17	***	*0.32*
DUCKS	# of ducks/municipal population in 2000	-0.22	***	*0.02*

significance level : *** : p< 0.01 ; ** : p < 0.05

Table 6.12 – Correlation between *livestock and marginality* and corresponding correlations with the proportion of migrants

The density of swine is (weakly) directly correlated to the proportion of migrants while density of goat and carabao are inversely correlated.

Two key elements appear at this stage:

First, while it is not allowed to statistically confirm **hypothesis 16** *(High marginality is associated to small animals, including poultry)* as well as **hypothesis 17** *(Low marginality is associated to the possession of cattle)*, we affirm that <u>livestock constitutes a real livelihood factor</u> (**hypothesis 15**). Actually, it is rather difficult to statistically test such a hypothesis but a set a clues[94] – revealed during our visits on field – persuade us that the survival of many families lie in livestock possession.

Second, the *relativity issue* is important in the light of the carabao case. Carabao (Fig. 6.9) appears to be very helpful for poor farmers/tree farmers and

[94] For instance, during our field survey, 65 respondents told us that they had livestock (chicken or pig/hog). About 90% of them use more than 75% of their chicken and/or chicken or pig for self consumption.

represents form them a valuable asset. While a motorized tractor is easily considered as a useful agricultural tool (inversely correlated to marginality), carabao constitutes also a valuable work tool for the poorest (even if carabao appears directly correlated to marginality). Therefore *a material possession classically linked to poverty may prove to be precious to whoever possesses*. Moreover, carabao has multiple advantages in comparison to tractor: it has no power failure and does not require special maintenance. These advantages are not negligible for the poorest.

Fig. 6.9 – The carabao, a precious asset for the poorest

d. Agricultural products

Differences in the correlations between marginality and type of agricultural products are observed (table 6.13). Among the 9 types of products in our database (rubber, yellow corn, white corn, banana, durian, fruits and vegetables, irrigated rice, rainfed lowland rice, rainfed upland rice), only 6 are significantly correlated to marginality. The dichotomy between the lowland-upland appears clearly in this case. Upland productions (white corn, rainfed upland rice, coffee) are directly correlated to marginality – inversely to the proportion of migrants[95] – while lowland productions (yellow corn, rainfed lowland rice and irrigated rice) are inversely correlated to marginality – irrigated rice production being directly correlated to the proportion of migrants.

[95] The correlation is less strong (r = -0.10) for coffee. Indeed, this product being a market-oriented product attracts more the migrants.

		r (Pearson)	
Code	Description	M	*P_MIG*
WHITCORN	White Corn Production (MT/municipal population in 2000)	0.32 ***	*-0.29*
RAINUP	Rainfed upland rice production (MT/municipal population in 2000)	0.28 ***	*-0.35*
COFFEE	Coffee Production (MT/municipal population in 2000)	0.25 ***	*-0.10*
YELCORN	Yellow Corn production by head (MT/municipal population in 2000)	-0.12 **	*0.04*
RAINLOW	Rainfed lowland rice production (MT/municipal population in 2000)	-0.15 **	*-0.03*
IRR_RICE	Irrigated rice production by head (MT/municipal population in 2000)	-0.29 ***	*0.27*

significance level : *** : $p< 0.01$; ** : $p < 0.05$

Table 6.13 – Correlation between *productions and marginality* and corresponding correlations with the proportion of migrants

e. Others findings

Finally, let us mention also that:

- the percentage of *Overseas Filipino Workers* (OFW) is negatively correlated to marginality (r = -0.55). This result is explained mainly by the remittances (cash sent from abroad).

- some other variables are strongly negatively correlated ($-0.86 < r <-0.66$) to marginality. These variables concerns *material properties* (percentage of households with a TV, a refrigerator, a washing machine, etc.): the marginality in a village is low if the household have such properties as expected. We must of course keep in mind that the initial variables – on which the index of marginality is constructed – are (already) individually strongly correlated to material possessions[96].

- the proportion of migrants by village is negatively correlated to marginality (-0.57). The more a village has migrants in its population, the lower the level of marginality will be. Marginality is more correlated to the proportion of migrants (r = -0.57) than the size of population (-0.54) and the natural logarithm of population (-0.47). This supports the found previously results (see section 6.2).

[96] This is not surprising: *a priori* a household that does not have toilets do not have either a television or a washing machine.

f. Correlations with the endogenous marginality

Endogenous marginality introduced in Chapter 5 is defined as the marginality free of any remoteness (R) effect. Such a marginality (M_{endo}) is defined through the residuals of model 5.7:

$$M = 0.0754\text{Ln(R)} + 0.1224 \tag{5.7}$$

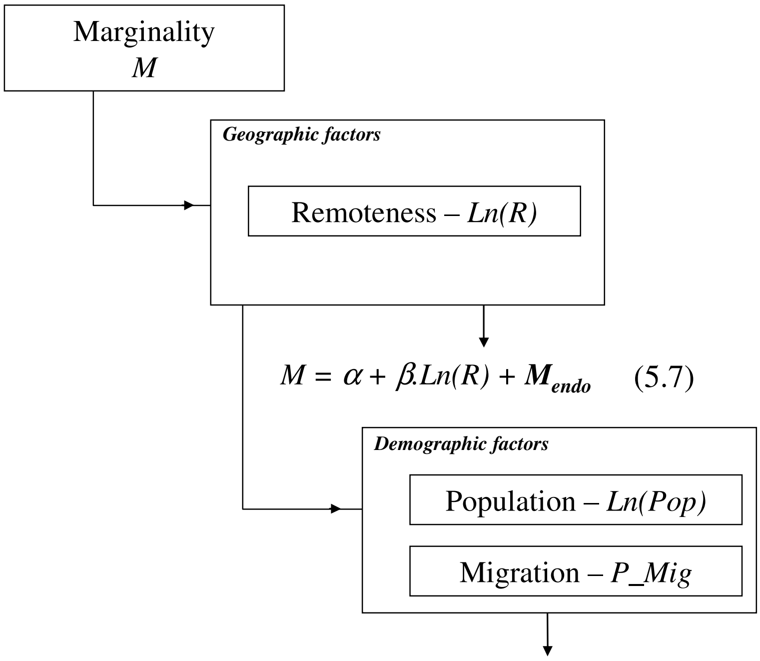
It maybe useful to identify what correlations may exist between our panel of variables (PEF) and the endogenous marginality.

However, at the end of Section 6.2, we conclude that the following model (6.4), integrating the population size and proportion of migrants in addition to remoteness, is the one who explained the most the variance of M (63% of the variance explained):

$$M = 0.048\ \text{Ln(R)} - 0.060\ \text{Ln(POP)} - 0.002\ \text{P(MIG)} \tag{6.4}$$

In this section we focus on finding the underlying factors rather than the demographic ones (population and migration). We feel concerned by the residuals of this latter model[97]. In other words, the residuals of the model 6.4 are considered here as a new candidate for endogenous marginality which would be defined as the marginality free of remoteness and demographic effects (Fig. 6.10).

[97] Although if we believe that these two aspects are involved in the endogeneity of a village.



$$M = \alpha + \beta.Ln(R) + \gamma.L(POP) + \delta.P\_MIG + \boldsymbol{M_{endo}\text{-}2} \qquad (6.4)$$

Fig. 6.10 – Two endogenous marginality concepts (M_{endo} and M_{endo}-2)

The correlation analysis that follows has two advantages: first to test M_{endo} and see if significant results appear and second the confrontation PEF. vs. M_{endo}-2 aims *sensu stricto* to identify possible non-demographic factors (since the demographic influences on the marginality are theoretically no more expressed in the residuals of the model 6.4).

Correlations between PEF and M_{endo} at provincial level are relatively similar to those observed with marginality (*M*). About same significant correlations and same hierarchy are found for all PEF. Three variables become significantly positively correlated to endogenous marginality (while these variables were not for M): pump irrigation open source (PISOS), rainfed upland rice production and durian production while one (fruits and vegetables production) becomes significantly negatively correlated but the correlation coefficients for these variables are low ($-0.23 < r < 0.19$) (see annex 12 for complete tables).

> Correlations between PEF and M_{endo}-*2* are relatively similar to those observed between PEF and M_{endo}. However, some significant correlations disappear (% of members 60 years old and above with SCID, % of solo parents, % of people with Community Organization, % of HHs engaged in fishing, durian production, rainfed upland rice production, goat density, swine density, PISOS, SFR, mechanical driers density, corn sheller density, mini-warehouse density) while some appears (% of HHs with business (-), mudboat density (+), horse density (+)) but for these latter the correlation coefficients are low ($|r| < 0.175$).

Observing the same structure of correlation on the one hand between PEF and *M* and on the other hand between PEF and M_{endo} and PEF and M_{endo}-2, we cannot – at this stage through this correlation analysis at provincial level – claim to the existence of endogenous factors of marginality. These factors could be identified but through a finer spatial level (the municipal level in this case).

6.3.4.2 Correlation at municipal level

a. Correlation with Marginality (M)

Most singular correlations between marginality (*M*) and PEF at the municipal level are presented in the table below (Table 6.14). The singularity of a given PEF is given by the *coefficient of singularity* (*s*) which is defined as the number of municipalities having the PEF among all its statistically significant PEF. Agusan del Sur being composed of 14 municipalities, the coefficient *s* ranges from 1 (PEF present in only one municipality) to 14 (PEF common to all municipalities). Variables present in up to 5 municipalities (whose $s \leq 5$) are called *singular variables.* In tables below (tables 6.14 and 6.15), only singular variables are given. We indicate also the first significant PEF observed in each municipality.

The most singular variables positively correlated to marginality have most often low correlation coefficients. For instance, the proportion of solo parents (P_SOLOP) appears to be rather singular to Bayugan – this variable is significant in only 3 municipalities – but its correlation coefficient is low ($r = 0.08$). The interpretation of such results is therefore rather risky. However the presence of squatters (P_SQUAT), manufacturing (P_MANUF), mining (P_MINING) or community services projects (P_CSPSERV) could be possible factors of endogenous marginality. Indeed, for these variables the correlation coefficient is rather high like their singularity. In other words, the presence of squatters in Sta. Josefa could be a reason (or a consequence[98]) of the municipal marginality. Similarly, the proportion of household engaged in community services projects in Trento could be a reason (or a consequence) of its marginality. Finally, the absolute first significant variables (positively correlated to *M*) are not singular ($s > 11$) (cropping and farming, forestry and poultry) except for Sta. Josefa and Trento (resp. % of squatters and % of disabled persons).

Most singular significant ($\alpha = 0.05$) variables positively correlated to marginality (M) by municipality (*)

Municipality	*Variables*	*r*	*s*
Bayugan	P_SOLOP	0.08	3
Bunawan	P_SQUAT	0.50	5
	P_MANUF	0.48	5
Esperanza	-		
La Paz	-		
Loreto	P_MIG (village)	0.11	1
	P_TRANSCOM	0.20	2
	P_COMORG	0.07	3
Prosperidad	P_CSPSERV	0.06	2
Rosario	-		
San Francisco	P_MANUF	0.04	5
San Luis	-		
Sibagat	P_GARBCOLL	0.06	1
	P_MANUF	0.04	5
Sta Josefa	P_SQUAT	0.29	5
Talacogon	P_CONSTRUC	0.07	2
	P_COMORG	0.02	3
	P_SQUAT	0.73	5
	P_MINING	0.26	5
Trento	P_CSPSERV	0.80	2
	P_CONSTRUC	0.31	2
	P_TRANSCOM	0.25	2
	P_SOLOP	0.08	3
	P_SQUAT	0.81	5
	P_MANUF	0.26	5
	P_MINING	0.12	5
Veruela	P_COMORG	0.27	3
	P_SOLOP	0.01	3
	P_SQUAT	0.48	5
	P_MINING	0.24	5
	P_MANUF	0.04	5

First significant ($\alpha = 0.05$) variables positively correlated to marginality (M) by municipality (**)

Municipality	*Variables*	*r*	*s*
Bayugan	P_CROPFGAR	0.66	14
Bunawan	P_POULTRY	0.92	11
Esperanza	*P_IP*	*0.71*	*13*
	P_CROPFGAR	0.68	14
La Paz	*P_IP*	*0.55*	*13*
	P_FORESTRY	0.55	11
Loreto	P_FORESTRY	0.69	11
Prosperidad	P_CROPFGAR	0.59	14
Rosario	P_CROPFGAR	0.92	14
San Francisco	P_POULTRY	0.86	11
San Luis	*P_IP*	*0.53*	*13*
	P_CROPFGAR	0.44	14
Sibagat	P_CROPFGAR	0.73	14
Sta Josefa	P_SQUAT	0.29	5
Talacogon	P_CROPFGAR	0.90	14
Trento	P_DISAB	0.83	8
Veruela	P_FORESTRY	0.68	11

(*) : only variables with a coefficient of singularity (s) singularity (s) below 5 are given.

(**) : if the proportion of IPs was the first significant variable, we have also presented the second one.

Table 6.14 – Significant positive correlations between PEF and *M*, municipal level

[98] Remain that no causality can be highlighted through the present analysis.

The most singular variables inversely correlated to marginality have often low correlation coefficients too (table 6.15). Forestry, poultry, business and the access to treatments appear to be possible reasons or consequences of the municipal marginality specific to some municipalities (for instance Rosario, San Luis or Sta. Josefa). Here too, the absolute first significant variables (inversely correlated to *M*) are not singular ($s > 11$ for all municipalities). In other words, for instance, literacy is the significant variable with the highest correlation coefficient in Bunawan but this factor is present as a significant factor in all other municipalities.

Most singular significant ($\alpha = 0.05$) variables inversely correlated to marginality (M) by municipality (*)			
Municipality	*Variables*	*r*	*s*
Bayugan	P_FISHING	-0.07	3
	P_BUSINESS	-0.06	5
Bunawan	P_FORESTRY	-0.22	3
Esperanza	P_POULTRY	-0.19	3
	P_TREAT	-0.09	5
La Paz	-		
Loreto	P_IP	-0.11	1
	P_TREAT	-0.24	5
Prosperidad	P_TREAT	-0.22	5
Rosario	P_TREAT	-0.45	5
San Francisco	P_TREAT	-0.23	5
San Luis	P_POULTRY	-0.54	3
	P_BUSINESS	-0.40	5
	P_FORESTRY	-0.03	3
Sibagat	-		
Sta Josefa	P_FORESTRY	-0.59	3
	P_POULTRY	-0.19	3
	P_FISHING	-0.13	3
Talacogon	-		
Trento	-		
Veruela	P_FISHING	-0.05	3
	P_BUSINESS	-0.18	5

First significant ($\alpha = 0.05$) variables inversely correlated to marginality (M) by municipality (**)			
Municipality	*Variables*	*r*	*s*
Bayugan	P_OFW	-0.66	14
Bunawan	P_LIT10	-0.83	14
Esperanza	P_LIT10	-0.80	14
La Paz	P_TRANSCOM	-0.73	12
Loreto	P_BOARD	-0.75	14
Prosperidad	P_LIT10	-0.60	14
Rosario	P_SOLOP	-0.63	11
San Francisco	P_RETAIL	-0.81	14
San Luis	P_FAMPLAN	-0.74	14
Sibagat	P_LIT10	-0.72	14
Sta Josefa	P_RETAIL	-0.78	14
Talacogon	P_BOARD	-0.87	14
Trento	P_LIT10	-0.91	14
Veruela	P_RETAIL	-0.65	14

(*) : only variables with a coefficient of singularity (s) below 5 are given.

(**) : Material properties variables (TV, VHS, washing-machine, etc.) are often the first significant variables. We present here the first significant "non-material properties variables"

Table 6.15 – Significant negative correlations between PEF and M, municipal level

b. Correlation with Endogenous Marginality (M_{endo}, M_{endo}-2)

The analysis of correlations between M_{endo}, M_{endo}*-2* and PEF at the municipal level shows almost different results than between *M* and PEF. The first significant variables correlated with marginality (*M*) are for almost all municipalities not at all significantly correlated with endogenous marginality (M_{endo} and M_{endo}*-2*). For instance, for

Bayugan, the first significant variable positively correlated to M is the proportion of HHs engaged in crop farming and gardening (P_CROPFGAR: $r = 0.66$, $s = 14$) while for M_{endo} and M_{endo}-2 it is respectively the proportion of disabled persons (P_DISAB: $r = 0.36$, $s = 1$) and the proportion of solo parent (P_SOLOP: $r = 0.32$, $s = 3$).

As a visual synthesis, table 6.16 below gives most singular significant variables for M, M_{endo} and M_{endo}-2. Each dot in this table corresponds to a municipality for which the variable is identified as singular. This table confirms that (i) the nature of the correlation (positive or negative) is always the same for singular variable correlated with M[99], and (ii) all variables concerning material properties (TV, refrigerator, etc.) are inversely correlated with endogenous marginality (M_{endo} and M_{endo}-2) in municipalities where they have been identified as singular.

Variables	M	M_{endo}	M_{endo}-2
P_SQUAT	●●●●●	●●●○	
P_IP	○		●
P_DISAB		●	●
P_60YSCID		○	
P_SOLOP	●●●	○	●○○
P_OFW		○○○○	○○○
P_FAMPLAN		○○○○	○○○
P_LIT10			○○○
P_BOARD		○○○○○	○○
P_COMORG	●●●	●○	
P_TREAT	○○○○○	●●	●○
P_GARBCOLL	●	○	○○
P_TV			○○○
P_VHS			○○○
P_PC		○○○○	○○○
P_REF			○○○○○
P_ELECTIRO			○
P_ELSLOVE			○○
P_WASHMACH			○○
P_MICROW		○○○○	○○
P_PHONE		○○○	○○○
P_AIRCON		○○	○○○
P_MOTORVEH			○○○

Variables	M	M_{endo}	M_{endo}-2
P_BUSINESS	○○○	●	●
P_CROPFGAR			●●●
P_POULTRY		●●○	●○
P_FORESTRY	○○○	●	●
P_RETAIL			○○
P_TRANSCOM	●●	○	○○○
P_FISHING	○○○	●	●
P_CONSTRUC	●●	○○○	○○○
P_MINING	●●●	○	○
P_MANUF	●●●●●	○○○	○○○
P_CSPSERV	●●	○○	○○

● : singular variable positively correlated
○ : singular variable negatively correlated
The number of dots corresponds to the number of municipalities for which the variable is present and singular.

Table 6.16 – Most singular significant variables correlated to M, M_{endo} and M_{endo}-2

[99] In other words, if a variable X has a positive correlation coefficient with M in a municipality, none negative correlation is observe for this variable in another municipality. Concretely, in the table 6.16, the dots in column M for a given variable are all black or all red.

6.3.5 Conclusion

The correlation analysis at the provincial level has highlighted the existence of more or less strong links between marginality and several socioeconomic variables. Some existing correlations are not surprising and fit within the frameworks already discussed in the literature.

First, we have observed the existence of sectoral factors linked to marginality. The "specialisation" in fishing, cropping and farming or in trading influences obviously the marginality level. The activities in which are engaged the local population constitute a key element to understand the marginality dynamics. Current activities in a region are always the result of its background, the evolution of the human and environmental capitals and the present and past opportunities. We have also observed that agricultural infrastructures and assets do matter. A certain differentiation by livestock and agricultural products seems to exist. Given (i) that the close link between activities, infrastructures and remoteness (e.g. fishing or crop farming is more present in remote uplands), (ii) that the dynamics of establishment and development of activities are complex and multi-factorial and (iii) that these dynamics are often influenced by environmental and demographic realities, it is rather difficult to establish causal links. Sometimes an activity is the cause, sometimes the consequence of the level of marginality. In the same way, the presence of agricultural infrastructures, associated with low marginality, leads to assume that these facilities promote local development but it is likely too that the agricultural infrastructures are the result of an economical dynamic and agricultural capital already established or initiated earlier.

Secondly, we observed a dominance of the variables of material goods/properties (TV, washing machine, etc.) as variables inversely correlated with marginality. This brings us to the question on the difficulty to capture a multidimensional reality (marginality) where the economical dimension often pollutes the other dimensions (social & political and spatial isolations).

Finally, we notice the absence of convincing results in the analysis of endogenous marginality. Indeed the same structure of correlation between marginality (M) and endogenous marginalities (M_{endo} as well as M_{endo}-*2*) is observed and the coefficients for endogenous marginalities are low. One might be tempted to conclude that there are no endogenous factors of marginality at the village level and that the only observed marginality's heterogeneity would come from remoteness. Now we have observed specific factors at municipal level (see *6.3.1.3*). This suggests that the endogenous marginality at the village level as defined by us is not robust enough or that the endogenous phenomena at village level are too complex to be highlighted through a basic correlation analysis.

6.4 Environment, Socio-economy, Marginality nexus: a conclusion

Analyses that were made in this chapter reveal essentially macro-factors of marginality – rather common and well known – such as spatial isolation, polarisation, urban centres attractiveness and the "positive" effect of rental activities. Usually these factors contaminate all other observable factors at lower levels (*microspatial* and *in situ/microperipherality* levels).

We expected to observe links between environment and marginality. It appeared through an analysis of the existing land use and its recent changes, that the environment of the province had actually been largely influenced by the entry of migrants and that where they were located, in general, the marginality was smaller and the activities more business-oriented, or even integrated into sustainable processes (regeneration areas). It is clear that many marginality-environment relationships observed in the province of Agusan del Sur come from institutional and market failures. Intensive logging, extensive plantations and push factors outside Agusan del Sur have generated large in-flows leading to a major natural capital reduction.

The OLS models showed then that the marginality was explained in part, in addition to spatial isolation, by demographic factors (population size and proportion of migrants).

To go beyond these possibly trivial or obvious factors, correlation analyses allowed the identification of several factors at provincial level. The activities of local people or their access to various agricultural infrastructures generate dissimilarities. At this level we also noted that in-migrants have strongly determined local activities as well as the access to the infrastructures.

The correlation analysis by municipality reveals the presence of local factors. However, singular variables (significant in less than 5 municipalities) correlated to marginalities (M and M_{endo}) have most often low correlation coefficients. Nevertheless, some variables were found to be possible marginality factors. For instance, the proportion of squatters, a working force engaged in manufacturing or mining activities appear to be possible reasons or consequences of the higher marginality levels observed in some municipalities. Conversely a working force engaged in forestry, poultry, cropping & farming or the access to treatments would be favourable to the development of some municipalities.

However, the first signs of weakness in the endogenous marginality index, as we have modelled it, appeared. At provincial level, the correlation coefficients PEF-M_{endo} are very weak and their interpretation rather non-trivial. At municipal level, we lack municipal information (for instance the mechanisms of infrastructures and services implementation or the type of *business* in which the households are engaged) and municipal background to understand the highlighted correlations.

At this stage, main factors of marginality have already been identified in the provincial context and the role of in-migrants is now better understood. However, in spite of the fact that none evident factors of endogenous marginality appears and *to go beyond* basic correlation analyses as done in this chapter, we use – in the next chapter – two more additional exploratory methods (LISA and FCA) in order to identified other possible mechanisms and/or factors of (endogenous) marginality that have not been highlighted yet.

Chapter 7

Marginality factors: Exploratory geostatistical analysis

Although the mapping of socio-economical indices and the basic statistical analyses of such indices (correlation, regression) are two essential steps in the geographical analysis of a given human problematic like ours, the use of explanatory statistical methods could be helpful to discover underlying mechanisms or factors. In the present chapter, we use local geostatistics (LISA) and factorial analysis (FCA) in order to identify spatial peculiarities or potential discriminant variables. Such methods would allow determining local mechanisms of marginality.

7.1 Local Indices of Spatial Association (LISA)

LISA technique allows identifying spatial clusters indicative of some local peculiarities. Such a technique may help in the identification of underlying determinants of marginality. Actually, the identification of spatial autocorrelation and/or local clusters may indicate the presence of a local explanatory factor of marginality (i.e. factors of *endogenous marginality*).

7.1.1 Utility of local geostatistics

One can not be satisfied with a single visual analysis of the maps of marginality that we have produced to identify local clusters where underlying potential factors of marginality are. As noted by Messner *et al*. (1999, p.427): “the conventional methods such as visual inspection that human perception is not sufficiently rigorous to assess the significant clusters and indeed tends to be biased toward finding patterns, even in spatially random data”. The identification of local patterns of spatial association has been the subject of numerous studies (Bartlett, 1975; Cliff and Ord, 1981; Ripley, 1981, 1988; Cressie, 1991; Stoyan *et al.*, 1995; Anselin, 1995, 1998; Getis and Ord, 1996; Fotheringham, 1997; Paraguas *et al.*, 2005). These studies led to the emergence of the explanatory spatial data analysis (or ESDA) (Haining *et al.*, 1998) and of the local indicators of spatial association (or LISA[100]), to formally and objectively identify the existence of *local peculiarities*.

Lee (2001, p.108) gives a clear definition of a local statistic and its utility: “a local statistic is a statistically processed value assigned to each spatial unit in a whole study region. Unlike a global statistic that intrinsically captures an average trend for the entire region; a local statistic calibrates a "place-specific deviate" from the average trend. (...) When local statistics is visualized, a researcher is allowed not only to explore how a particular locale is deviated from a global trend, but also identify spatial regimes that are spatial clusters of similar deviates”.

The LISA indices, described hereafter, are more and more used in studies dealing with development and poverty. For instance Müller *et al.* (2006) use LISA to assess and reveal spatial relationships in the poverty-forest nexus while Farrow *et al.* (2005) use such indices to explore the spatial variation of food poverty in Ecuador. Amarasinghe *et al.* (2005) proceed to a spatial clustering analysis of rural poverty and food insecurity in Sri Lanka. Oliveau (2004) thanks to LISA analyses the links between village modernity and distance to city. The objective is always to identify statistically significant clusters which enable the researcher to eventually focus on underlying variables highlighted by such clusters.

[100] LISA are also known as *spatial clustering*.

7.1.2 Local Indicators of Spatial Association (LISA)

Spatial autocorrelation indices allow to show interacting places compared to two simultaneous criteria: (i) the spatial proximity and (ii) the similarity or contrast between the values of the same variable in different places in the study area (Flahaut, 2001). Two kinds of indices may test the presence of autocorrelation: the global indices and the local indices. The global indices such as the global Moran *I* or the Geary's *C* indicate whether the values are distributed - across the studied area - randomly (no autocorrelation) or on the contrary if there is autocorrelation. In the case of positive autocorrelation, similar values of the value observed in a given location are clustered in space. In the presence of negative autocorrelation, the most dissimilar values of the value observed in a given location are clustered in space. The global index is split out into local indices in order to identify the individual contribution of each place; they measured successively for each dependency / spatial association between the value of the variable taken in this place and all those taken in its neighbourhood. These local indices allow us to detect pockets of local spatial autocorrelation (Flahaut, 2001).

The Moran's index (Moran's I) was selected, because it seems generally more efficient than others. As mentioned by Oliveau (2005), Moran's I, as the coefficient of Geary (Geary's *C*), is based on the average and is therefore not very sensitive to outliers. Moreover, it is more stable than the second because it measures the deviation from the mean and not the differences between neighbours. From a statistical point of view, the two indices are "reasonably" robust, but Moran's I shows an advantage over the Geary's *C* (Cliff and Ord, 1981).

The global Moran (*I*) is defined as follows (after Anselin, 1995):

$$I = \frac{N}{W} \cdot \frac{\sum_{i \neq j} w_{ij} \cdot \left(X_i - \overline{X}\right) \cdot \left(X_j - \overline{X}\right)}{\sum_i \left(X_i - \overline{X}\right)^2} \tag{6.1}$$

where X_i is the value of the variable at point *i* and X_j is the value of the variable at point *j* (neighbourhood), $\overline{X}$ is the mean, *N* is the number of places and $W = \sum_i \sum_j w_{ij}$ with w_{ij} = 1 if *i* and *j* are contiguous, 0 otherwise. The index varies from -1.0

(dispersed[101]) to +1.0 (aggregated). A value close to 0 corresponds to random distribution.

The local Moran index (I_i) is given by the following formula:

$$I_i = \frac{\left(X_i - \overline{X}\right)\cdot \sum_j w_{ij}\left(X_j - \overline{X}\right)}{\sum_i \frac{\left(X_i - \overline{X}\right)^2}{N}} \qquad (6.3)$$

If index I_i is negative, it reflects a negative spatial autocorrelation which is an association of dissimilar values to the value of point *i*. Conversely, if index I_i *is* positive, it reflects a positive spatial autocorrelation which is an association of similar values to the value of point *i*.

Traditionally, the results are presented in the *Moran Scatter Plot* (Fig. 7.1). Anselin (2002) described it as a plot showing for each place *i* the values of its neighbours (called *spatial lag*) on the vertical axis and the original variable on the horizontal axis.

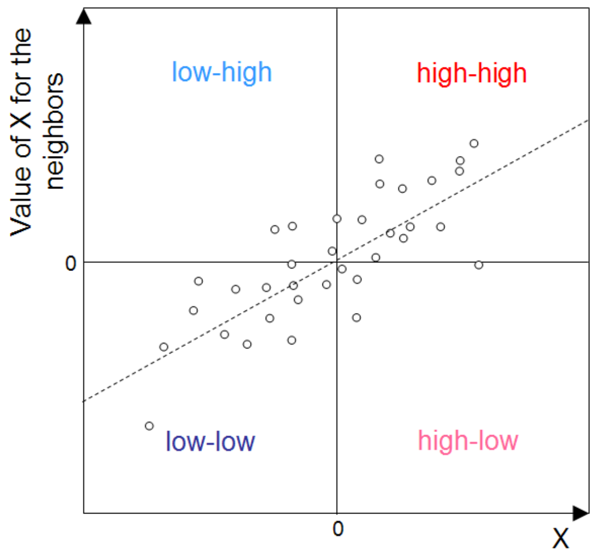


Fig. 7.1 – *Moran Scatter Plot* and its four quadrants (fictive plot)

[101] In fact, the *dispersed* configuration corresponds to a situation where the values are locally opposed.

Based on the *Moran Scatter Plot*, it is possible to classify the elements – in our case the villages – in four categories (table 7.1):

category		*squatter plot quadrant*	*autocorrelation*	*intrepretation*
high-high (HH)		upper right (red)	positive	a spatial entity with high value surrounded by spatial entities with high value
high-low (HL)		lower right (pink)	negative	a spatial entity with high value surrounded by spatial entities with low value
low-low (LL)		lower left (blue)	positive	a spatial entity with low value surrounded by spatial entities with low value
low-high (LH)		upper left (light blue)	negative	a spatial entity with low value surrounded by spatial entities with high value

Table 7.1 – The four categories of the *Moran Scatter Plot*

7.1.3 Neighbourhood determination and relative remoteness

The LISA indices use a local neighbourhood. The value at a point *i* is compared to values observed at *j* in its neighbourhood. Therefore, it seems quite obvious that the results vary depending on the selected neighbourhood. Indeed, the number of neighbours depends on the neighbourhood type (Fig. 7.2). Several tests were conducted to see how varied the values of the indices are with the local neighbourhood.

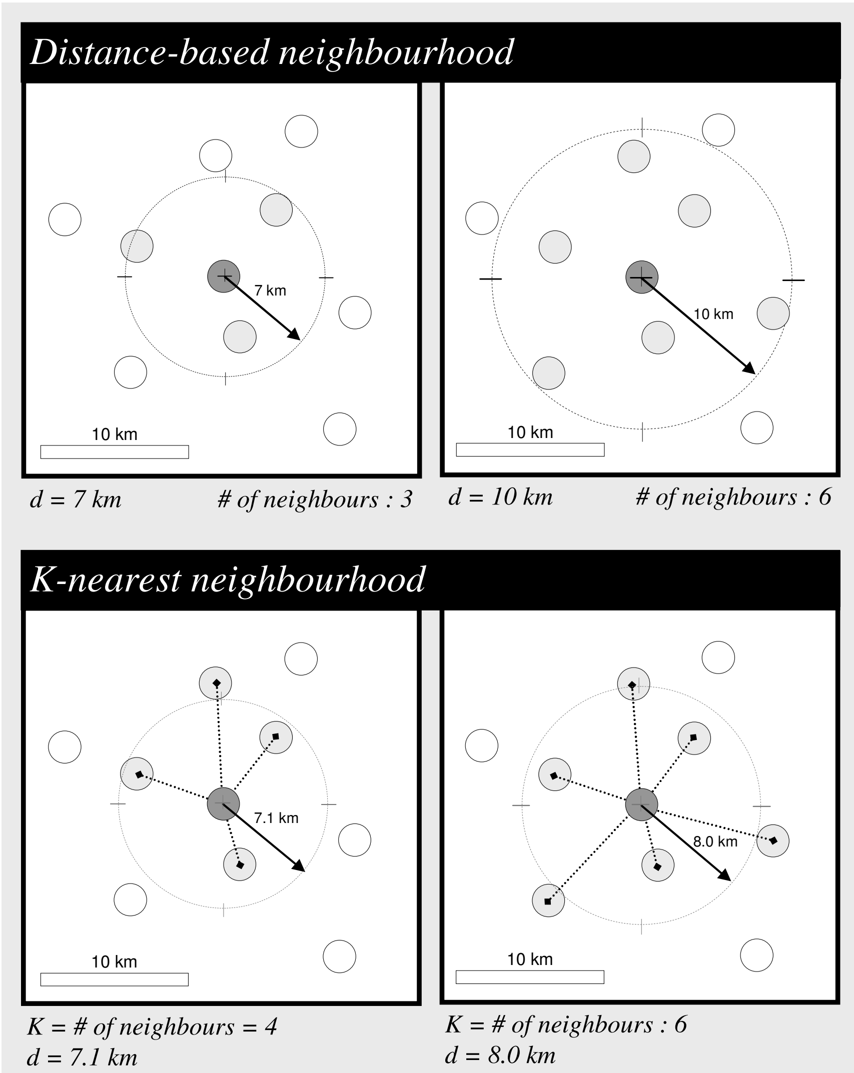


Fig. 7.2 – Distance-based neighbourhood and K-nearest neighbourhood

We tested the global Moran's I (for M and M_{endo}) for different values of neighbourhood whose values are presented in the figure below (Fig. 7.3):

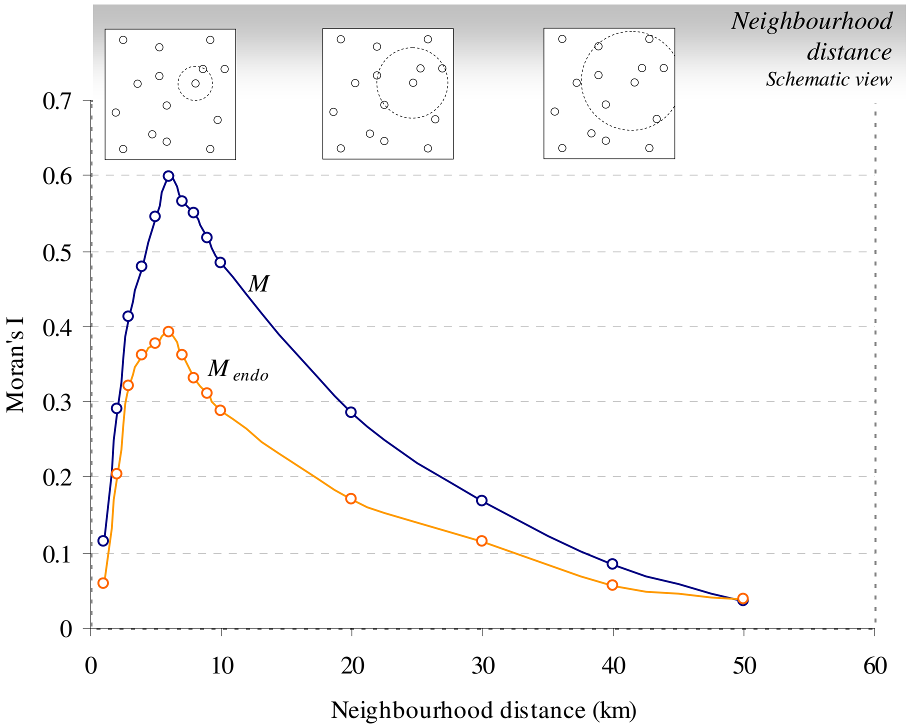


Fig. 7.3 – Moran's I vs. neighbourhood distances for marginality (*M*) in Agusan del Sur

The global Moran index is maximal for a neighbourhood distance of about 6 km. In other words, globally, the influence of a village on another one decreases beyond that distance. Finally, to ensure each location has a sufficient number of neighbours, we use a 4-nearest neighbourhood[102].

It is not surprising that the distance to the nearest neighbour is more important when the distance from the highway increases, as shown in the map below (Fig. 7.4). In the mountains, west of the province, the distances to the nearest neighbour can reach 10 km, reflecting an important *relative remoteness*[103].

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[102] With such a neighbourhood we have to keep in mind that the neighbourhood distance (i.e. the radius of the circle around each point) varies for each point.

[103] Relative remoteness is considered here as the spatial isolation between a village and its neighbourhood.

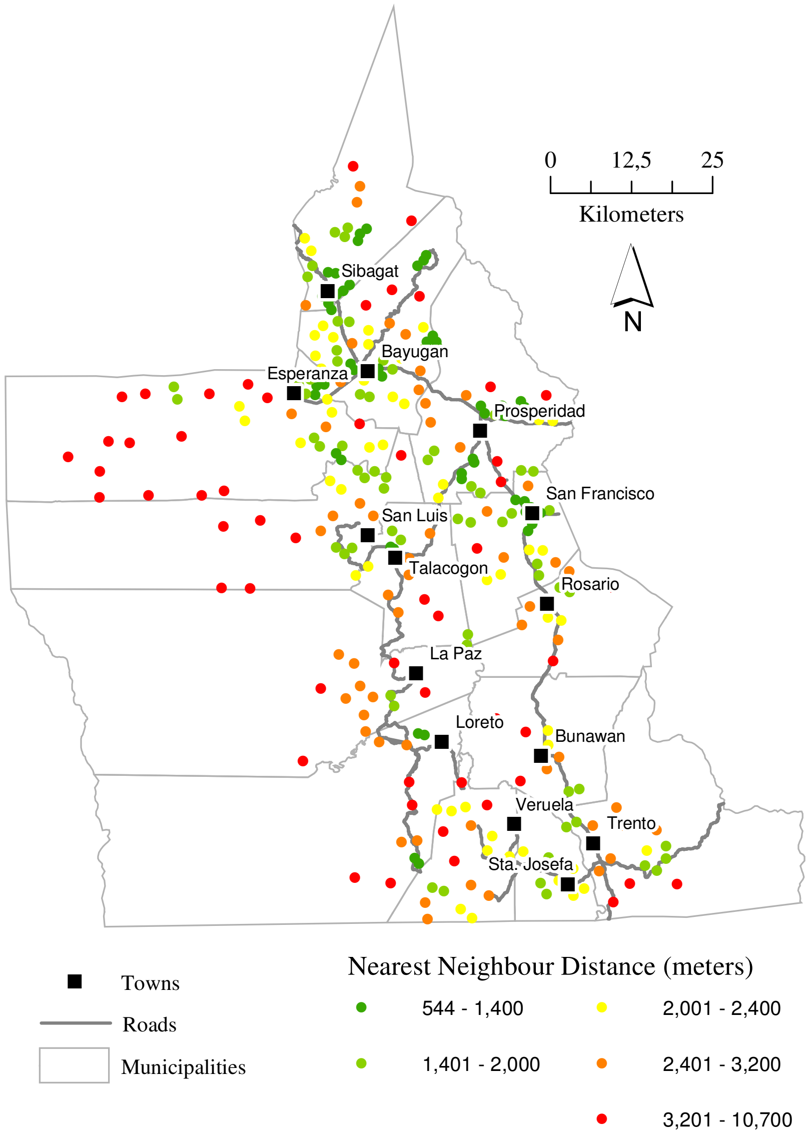


Fig. 7.4 – Nearest Neighbour Distance (dNN) for each village in Agusan del Sur

7.1.4 Relative remoteness: another key factor?

The distance to the nearest neighbour appears correlated to the marginality (*M*) with a Pearson's *r* of +0.43. Low (resp. high) nearest neighbours distance correspond to low (resp. high) marginality levels. In other words, the more remote a village from neighbouring villages is the more important its marginality is. Many studies have already reported this phenomenon linking *relative remoteness* and poverty (de Haan and Lipton 1998, Jalan and Ravallion, 1997, 2000; Bird and Shepherd, 2003). Bird *et al.* (2007) as well as Hulme *et al.* (2001) refer to the concept of *spatial poverty trap* (already mentioned above) in which relative remoteness is a major explanatory factor of poverty.

An inverse relation is observed between nearest neighbour distance and the proportion of migrants by village (Pearson's r = -0.38). This finding must to be noticed: the in-migrants would be not attracted by relatively remote villages[104].

No significant correlations between nearest neighbour distance and population (Pearson's r = -0.09), as well as endogenous marginality (Pearson's r = 0.22), are observed.

7.1.5 Global and local Moran's I within Agusan del Sur[105]

The global Moran's I index has been computed for the index of marginality (M) and for the index of endogenous marginality (M_{endo}) based on a 4-nearest neighbourhood (Table 7.2).

	M	M_{endo}
Moran's I	0.65	0.43

Table 7.2 – Global Moran indices values for M and M_{endo} for villages within Agusan del Sur

The value of I of +0.65 for the index M indicates clearly that we are not facing a random distribution and that the villages with similar values are spatially aggregated.

The Moran Scatter Plot is given at figure 7.5. Local Moran's I_i for the index of marginality M within Agusan del Sur are mapped hereafter (Fig. 7.6). It is easy to identify categories HH, LL, LH and HL as described above. The mapping of local Moran indices clearly shows the existence of *clusters*. The clusters including high-high locations will be called *hot spots* while clusters including low-low locations will be called *cold spots*. Two cold spots of marginality are clearly noticeable around the towns of Bayugan, San Francisco and Rosario. One hot spot of marginality is manifested in north Sibagat. Western part of Agusan del Sur is almost composed of

104 However, we have to keep in mind that this analysis is based on villages' locations whose accuracy depends of the digitalization of points. Each point figuring a barangay has been located close to the main 'centre' purok.

105 The local Moran's I_i index was computed thanks to GeoDa™ software both for M and M_{endo}.

high-high locations. This map highlight more efficiently that proximity to towns and topography both influence marginality level.

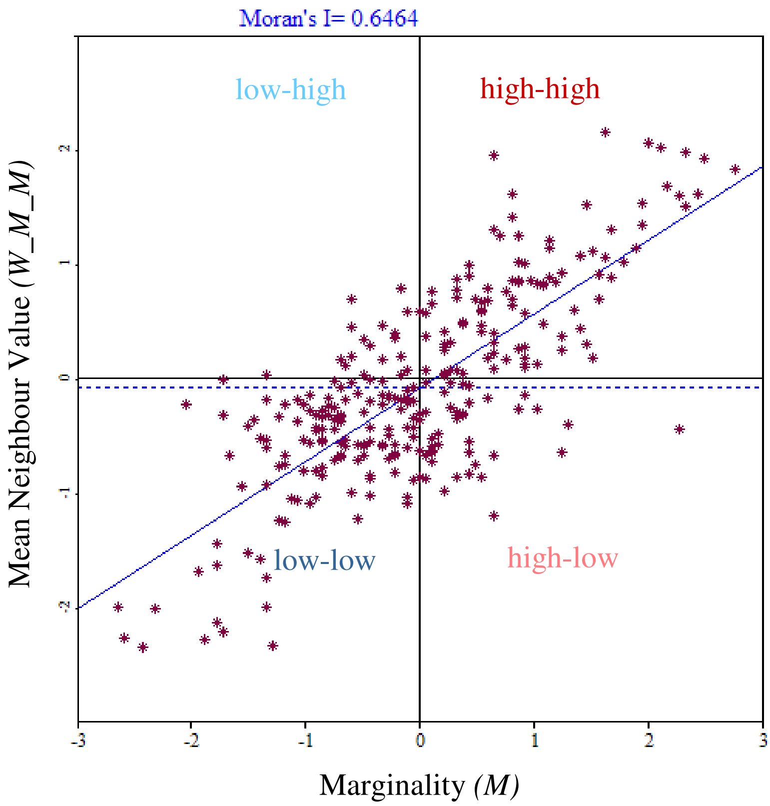


Fig. 7.5 – Moran Scatter Plot for marginality (*M*), Agusan del Sur

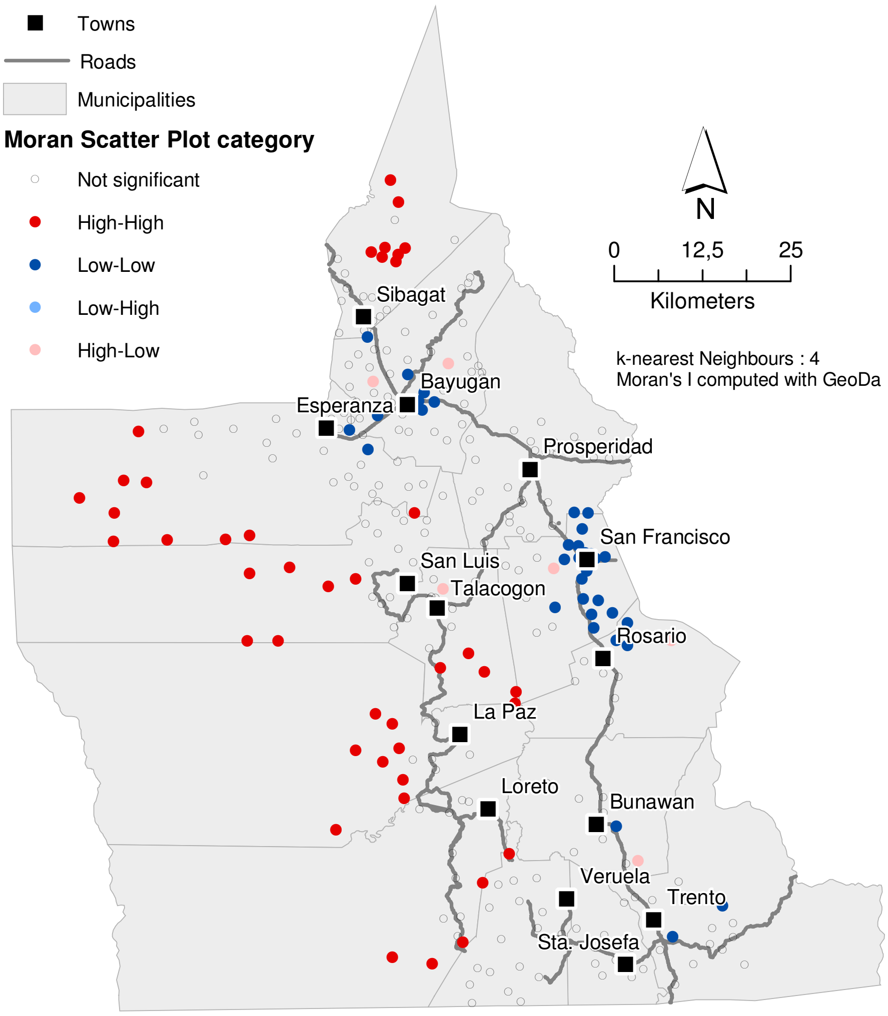


Fig. 7.6 – Moran Scatter Plot categories for each village (*M*)
(4-nearest neighbours; p=0.05)

It is also interesting to analyze the types HL and LH. The fact that a village has a high (resp. low) marginality level while its neighbours have a low (resp. high) marginality level should question us. Why such a village is particularly distinct from its neighbours? What are the factors inherent to such a village? Do these factors play a key role in the situation of marginality (which would then be considered as *endogenous factors*)? What factors related to the village's background could explain this situation?

These categories are represented in pink and light blue on the map 7.6. Five villages are classified as HL, none as LH. As for an example, let's analyze the situation of Ladgadan, west of San Francisco (Fig. 7.7).

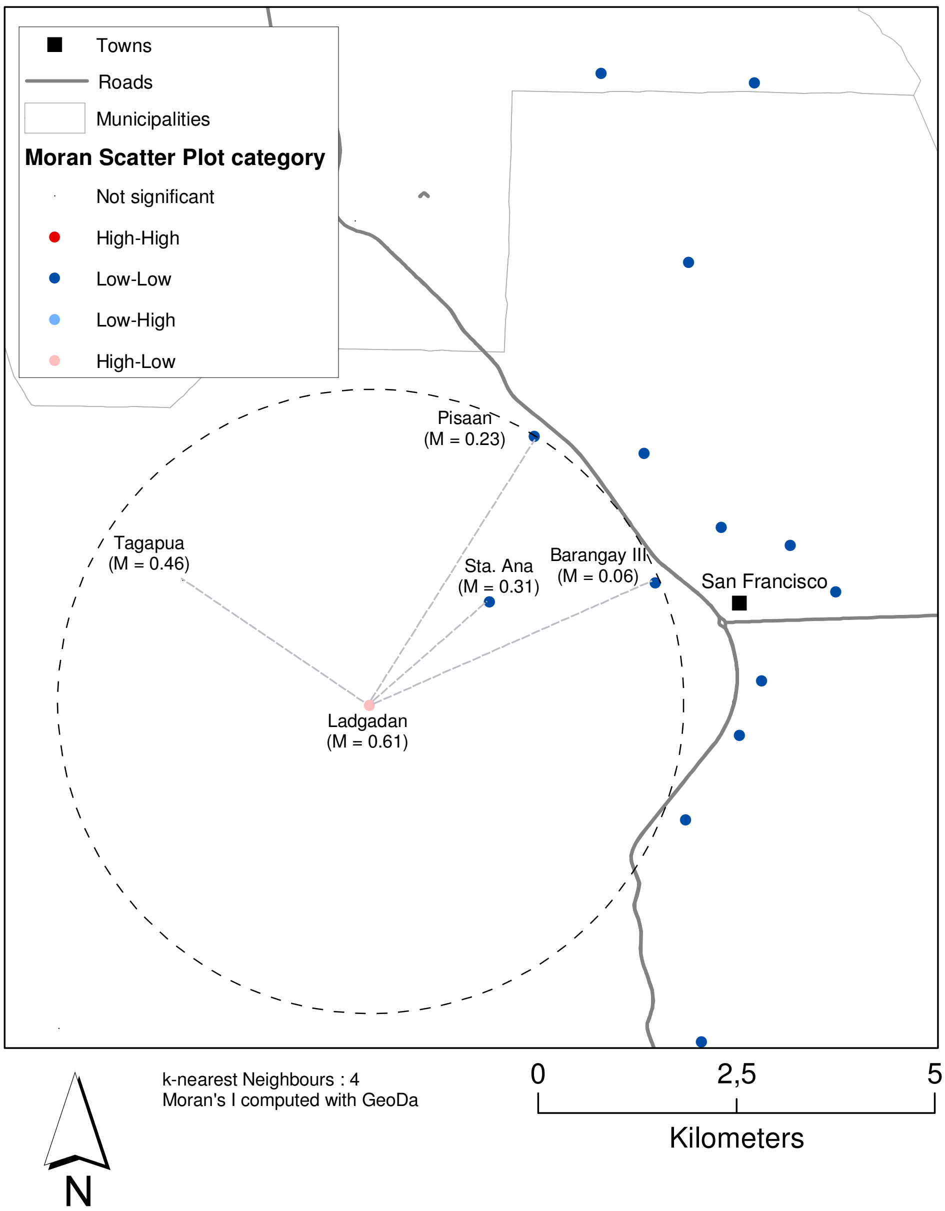


Fig. 7.7 – Ladgadan and its neighbour:
Marginality level and type of cluster

Ladgadan CBMS-profile (the values of its 13 CBMS variables) and the four nearest villages – Tagapua, Pisaan, Sta. Ana and Barangay III – are shown below (Fig. 7.8):

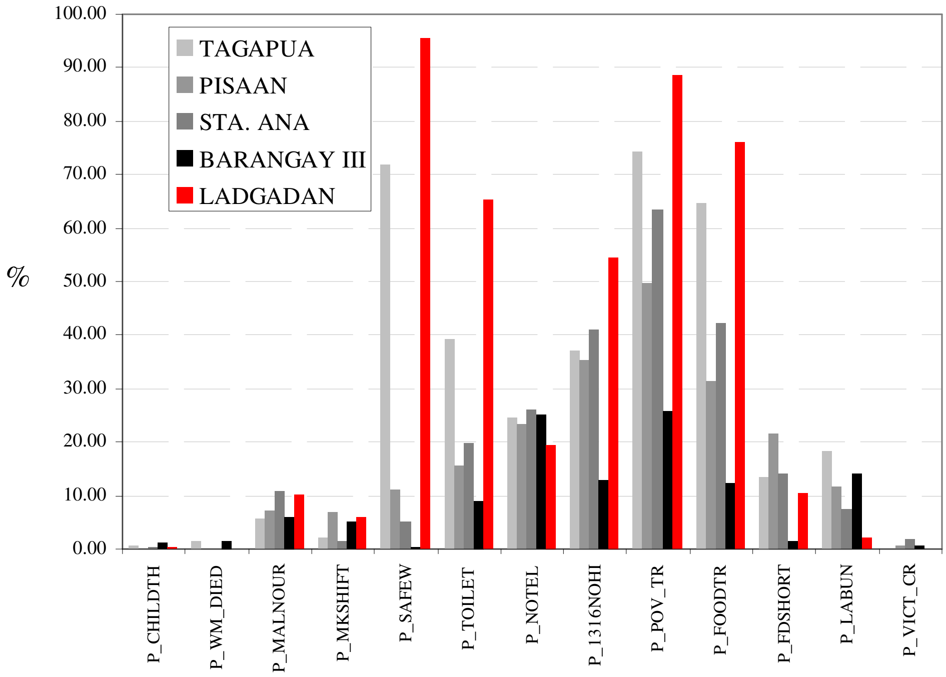


Fig. 7.8 – CBMS-profile for Ladgadan and its neigbourhood

It appears in particular that access to safe water and sanitation are two specific factors that explain why Ladgadan is rather different from its neighbours. The food threshold also seems discriminatory. In this example, these factors may be considered as *factors of endogenous marginality*.

Finally it would be interesting to see what clusters are identified based on the endogenous marginality index (M_{endo}). On figure 7.9, cold spots of endogenous marginality are also recognizable around San Francisco and Rosario on the one hand and around Bayugan on the other hand but with a shift to eastern upland. This confirms as mentioned above that these towns induce positive *spillover effects*. In other words, despite the removal of remoteness, the influence of towns on surrounding villages appears. The Sibagat's hot spot observed on figure 7.6 does not appear in this case. This means that while north Sibagat has relatively high marginality level, no significant endogenous marginality appears. Marginality would be mainly explained by remoteness to towns. Like we have observed on marginality, here too the western part of Agusan del Sur is almost composed of high-high endogenous marginality locations. In these places factors of endogenous marginality would exist. In these areas, the local particular context is a driving factor of endogenous marginality.

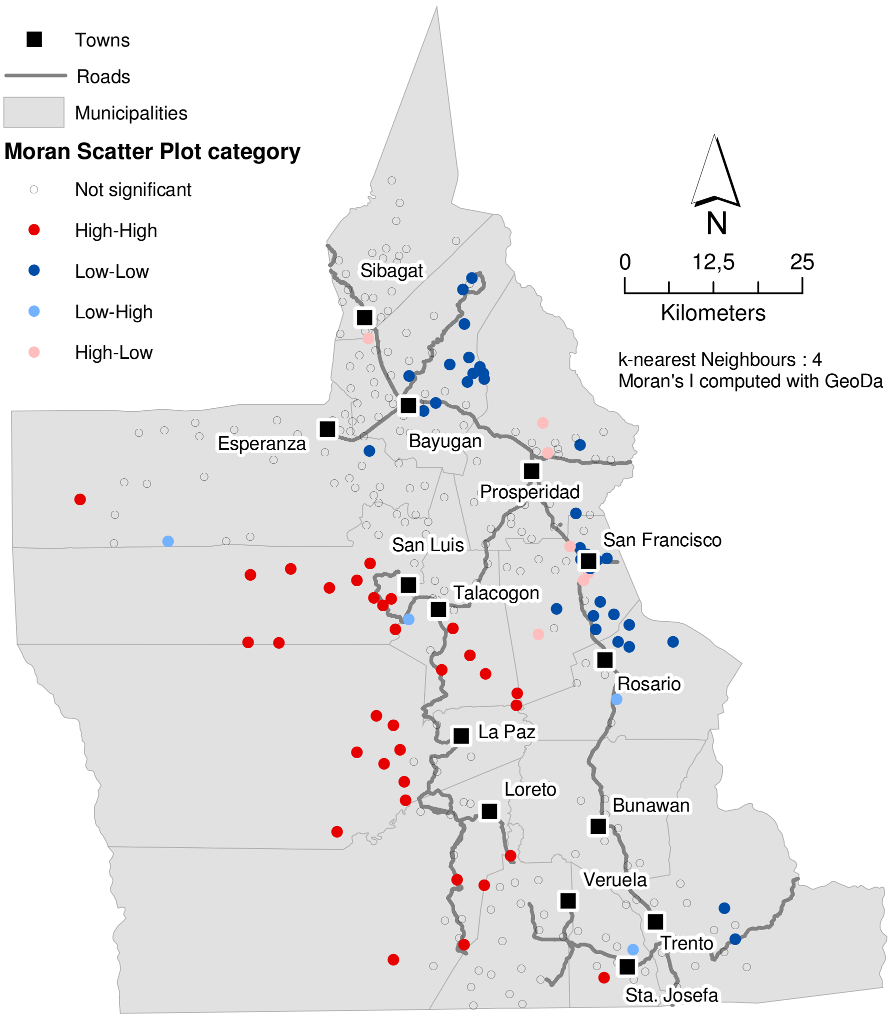


Fig. 7.9 – Moran Scatter Plot categories for each village (M_{endo})
(4-nearest neighbours; p=0.05)

7.1.6 LISA: a conclusion

LISA analysis was used here as an exploratory method. This technique helps to locate homogeneous clusters (high-high / low-low) and local peculiarities (high-low / low-high). Our analysis has shown several interesting findings.

First it appears that the neighbourhood is significant in the geographical study of marginality. Indeed, the relative remoteness seems to constitute a key feature in the understanding of the marginality's spatial structure.
Second, Global Moran values show that marginality (M) – like endogenous marginality (M_{endo}) – has not a random distribution confirming the existence of underlying geographical structures in the (endogenous) marginality mechanisms.

Third, the Moran Scatter Plot for marginality and its corresponding map have revealed that a positive autocorrelation was dominant (mainly *high-high* and *low-low* types): in general a village has similar value of marginality than the villages in its neighbourhood. In addition, topography and towns seem to play a key role for marginality. Moreover the analysis has shown that oppositions could be relevant: the localisation of *high-low* or *low-high* villages and the analysis of their socio-economical profile would help to identify potential factors of endogenous marginality.

Fourth, the comparison between local Moran's I_i for M and M_{endo} has revealed similarities (cold spots for M as well as for M_{endo} around Esperanza, Bayugan, San Francisco and Rosario) and dissimilarities (spatial shift, spillover effect). This also confirms the existence of underlying geographical structures as well as the relevance of our endogenous marginality concept. The obtained results constitute a certain validation to the M_{endo} measurement.

As already said, LISA analysis emphasizes spatial patterns but this geostatistical technique is not able to directly highlight any potential local explanatory factors. Factorial correspondence analysis (FCA) – developed in the next section – helps in the identification of such factors.

7.2 Factorial Correspondence Analysis (FCA)

The Principal Component Analysis (PCA) aims to identify, through the reduction of *n* variables into *p* factors (with $p<n$), the general trends from complex data, while LISA helps us to locate homogenous clusters and local peculiarities. The Factorial Correspondence Analysis (FCA), developed in this section, focuses on identifying specific factors of similarities and oppositions. All these statistical tools allow us to formulate relevant questions (Fig. 7.10).

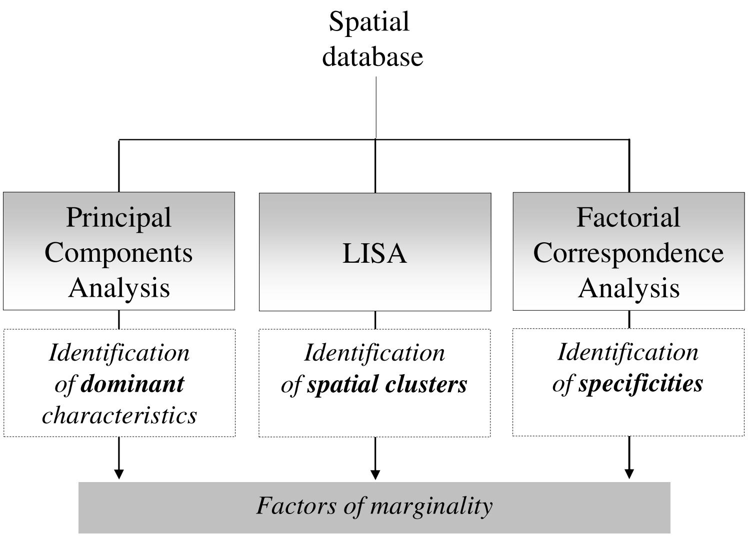


Fig. 7.10 – PCA, LISA and FCA, three statistical tools to identify factors of marginality

FCA notions and interpretation's rules are given in annex 13. In our case, one of the outputs of FCA is a *F1-F2 plane* where villages and potential specific explanatory factors (PEF) are represented by points (called *village-points* and *PEF-points* hereafter). The relative position of each point and their distance to the origin (0,0) (called *centre of mass*) highlight similarities and oppositions existing between the villages' profiles[106] and constitute an appropriate tool to better understand the leading factors of marginality[107].

[106] Villages' profiles correspond to the vector of *standardized effectives* (frequencies) of explanatory factors (see annex 13 for a formal definition).

[107] FCA is conventionally used to study correspondence matrixes (frequency tables) between two qualitative variables. By extension, spatial units can be regarded as one of the dimensions of a correspondence matrix (Waniez and Pissoat, 2006).

One always study the plane created by axis 1 and 2 (Fig. 7.11), and sometimes the ones created by axis 1 and 3 or 2 and 3 as well, but rarely more. Here are some interpretation's rules (adapted from Benzécri, 1992):

(i) distance from the origin
The origin of the graph, e.g. the coordinates (0,0), is also called c*enter of mass*. This corresponds to the *average profile*. It is from this point that the gap is calculated. The more a point is distant from the centre, the more it deviates from the average profile.

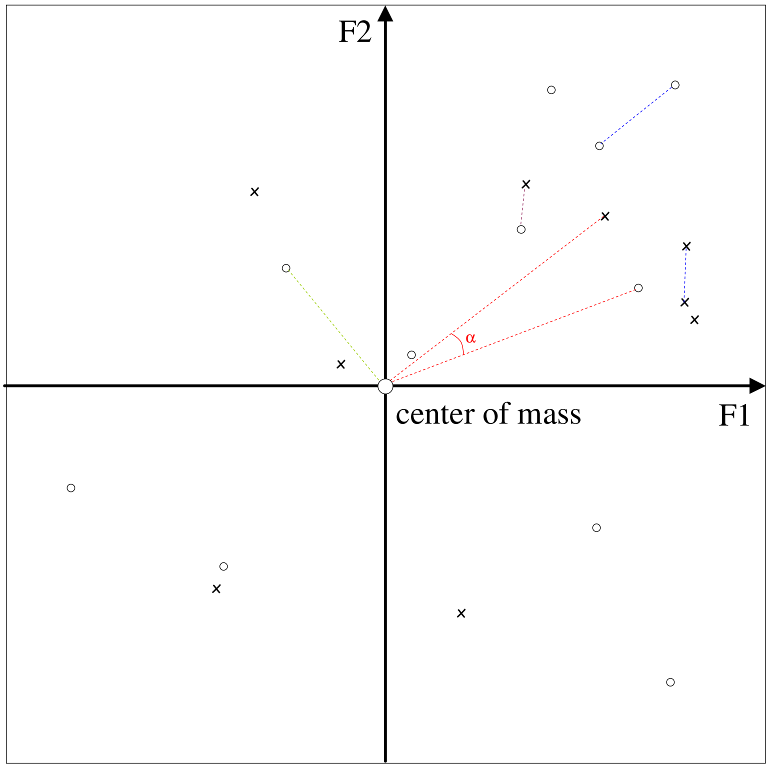
(ii) interpretation of the distance between points of a same cloud
One should only consider the positions relative to an axis of the points belonging to a same cloud. Two points close on the graph will have a similar profile.

(iii) interpretation of the distance between points from different clouds
The distance between points from different clouds can be interpreted in an asymmetric plot[108]. A PEF-point close to a village-point means that the village's profile is influenced by this PEF.

(iv) angular interpretation between points from different clouds
We can interpret the *angle* (α) between a row-point and a column-point following some simple rules:

- if the angle between two points is acute (< 90º), the two characteristics for which the points stand for are correlated;
- if the angle is obtuse (> 90º), the points are negatively correlated ;
- if there is a right angle, the points do not interact.

[108] It is extremely uncertain to interpret the proximity between two points from two different clouds in a *symmetric plot* (i.e. based on the principal coordinates). Indeed, the distances between row points and column points cannot be interpreted because these distances do not approximate any defined quantity (Hoffman and Franke, 1986; Kuhfeld, 1995; Hill and Lewicki, 2006). However this problem may be overcome by using an *asymmetric plot* (i.e. using the principal coordinates the standard coordinates for the rows and columns or vice versa) (Greenacre and Hastie, 1987).



○ Line
× Column

(i) Distance to center of mass (green)
(ii) Distance between 2 modalities (blue)
(iii) Distance between line and column (mauve)
(iv) Angle between 2 modalities (red)

Fig. 7.11 – FCA, distances and angles in F1-F2 plane (asymmetric plot)

7.2.1 Data

FCA needs that the inputs be in raw format (not as a percentage). Since the sum of lines of the *contingency table* must be meaningful (see annex 13), the PEF should have the same unit. Among all PEF, some concern households while others concern individuals or municipalities. Others concern the surrounding environment. For this reason, four FCA are processed at different scales: (i) FCA at household level (FCA on PEF relative to household called *HHs-PEF* hereafter), (ii) FCA at individual level (FCA on PEF relative to individual called *ind-PEF* hereafter), (ii) FCA at municipality level (FCA on PEF relative to municipality called *muni-PEF* hereafter) and (iv) FCA with environmental PEF (FCA on PEF relative to surrounding environment called *envi-PEF* hereafter).

7.2.2 Results

i. FCA at household level (HHs-PEF)

HHs-PEF-points are presented in F1-F2 graph below (Fig. 7.12). Three PEF are more distant of the centre of mass (t: HHs engaged fishing; b: HHs with access to garbage collection; v: HHs engaged in mining and quarrying). These three variables "play" a key role telling that some villages are away from the average profile (corresponding to the *centre of mass*). The PEF are organized in a parabola shape. This means that a *curvilinear correlation* – also known as *Guttman effect*[109] – exists. A gradient is observable: the material-goods variables (TV, washing machine, etc.) are at right while variables linked to activities (forestry, poultry, etc.) are at left.

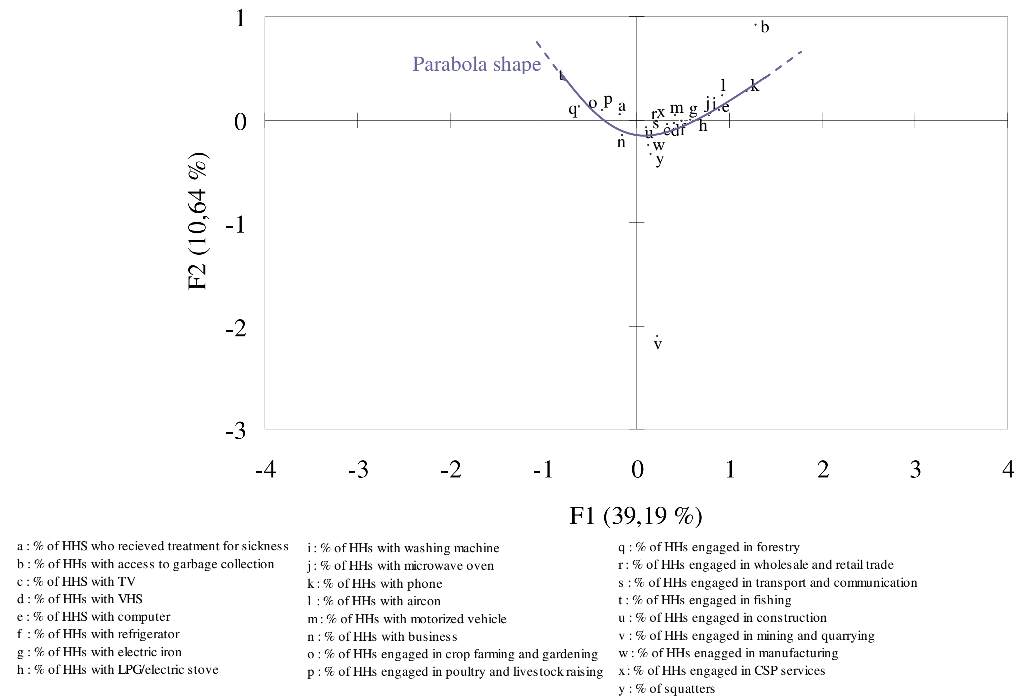


Fig. 7.12 – FCA: HHs-PEF-points in F1-F2 plane
and the observed *parabola shape*

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109 The parabolic shape is known as the *Guttman effect* or *horseshoe effect* (Cibois, 2007; Clavier and Chardy, 1989). The Guttman effect reveals the existence of a predominant factor expressed, here, through the two first axes. Hill (1974) proves that this situation must exist for equal correlations between variables. Removing the Guttman effect (called *detrending*), defended by some (Peet *et al.*, 1988) and rejected by others Wartenberg *et al.*, 1987), is discussed by Jackson and Somers (1991).

According to F1-F2 projections, three directional axes are identified: (i) material goods, (ii) traditional activities and (iii) *market-oriented* activities[110] (Fig. 7.13). This distinction will be helpful for the interpretation of the villages' clouds (Fig. 7.14). Activities do not discriminate in the same way. For instance mining or fishing, more distant from the centre of mass, are therefore more discriminating factors than manufacturing or poultry, close to the centre of mass.

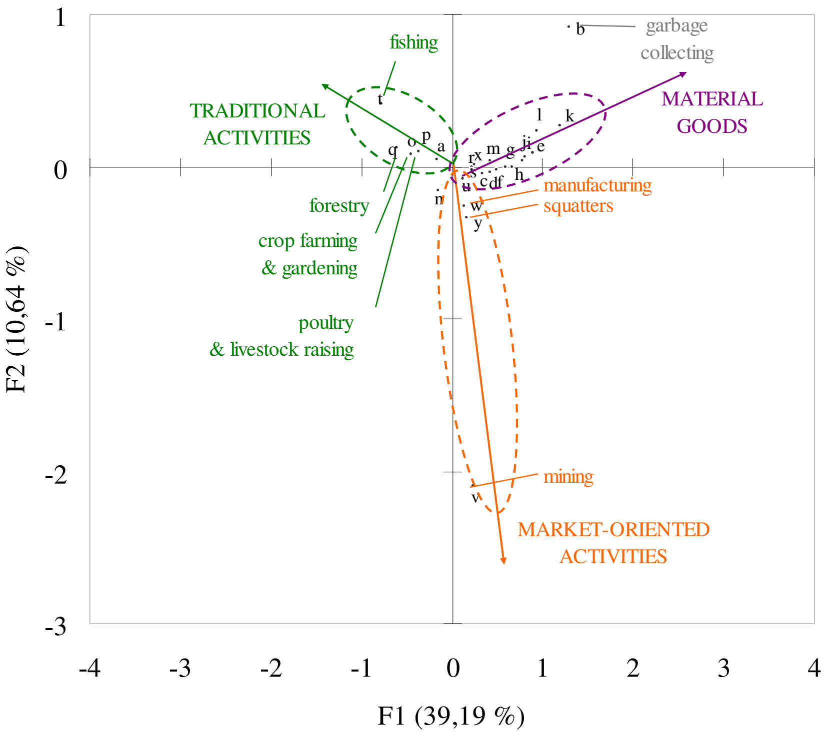

Fig. 7.13 – FCA: Identification of three directional HHs-PEF-points clouds

[110] Orange axis is called *market-oriented activities* because mining, usually accompanied by squatters, and manufacturing are clearly market-oriented and/or speculative activities.

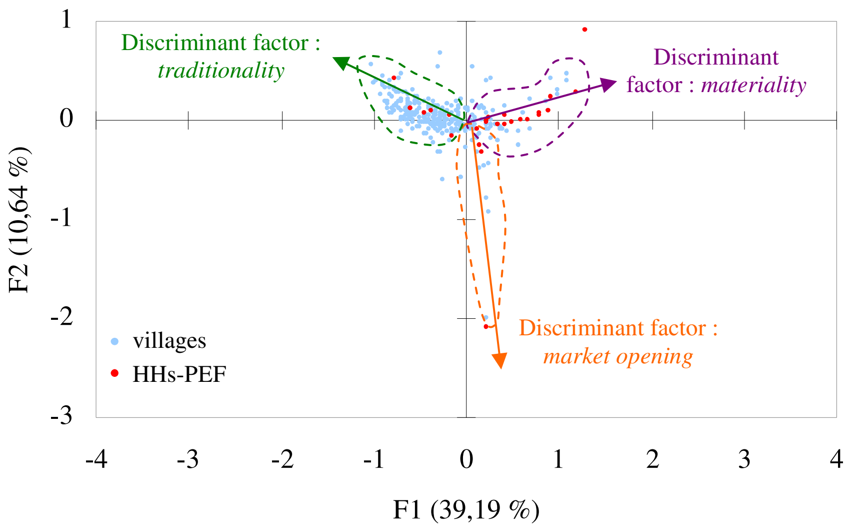

Fig. 7.14 – FCA: HHs-PEF-points and village-points in F1-F2 plane

Three discriminant factors may be identified corresponding to the three axes: *traditionality*, *materiality* and *market opening*.

The map of F1-values shows the opposition of the two main discriminant factors, traditionality vs. materiality (Fig. 7.15). Once again, the structural role of highway appears. Here it is more the access to electricity that must be noticed. Indeed, material goods need electricity. Without surprise, electricity does matter. The access to electricity is rather discriminant.

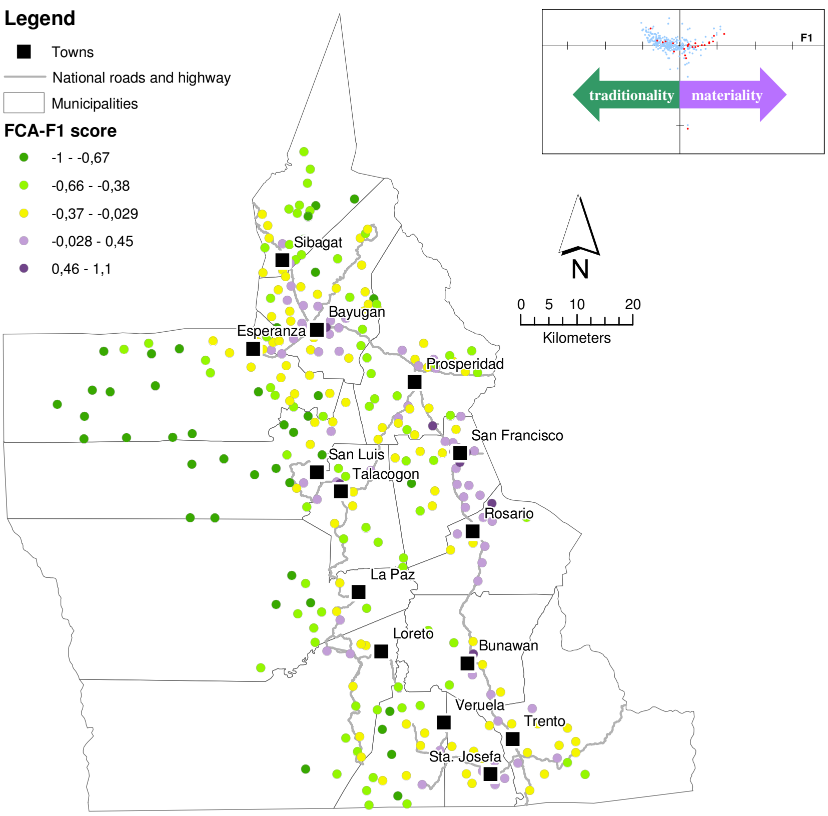

Fig. 7.15 – FCA: Opposition between *traditionality* and *materiality* on F1

One sees clearly on figure above a similar spatial configuration with marginality (see figure 5.4). Indeed, by projecting the villages in F1-F2 with a size of points proportional to the marginality index (*M*) (Fig. 7.16), the parabola shape (Guttman effect) – previously highlighted through figure 7.12 – reveals a *marginality gradient*. Low marginal status of villages is mainly linked to the possession of assets while high marginal status is linked to traditional activities.

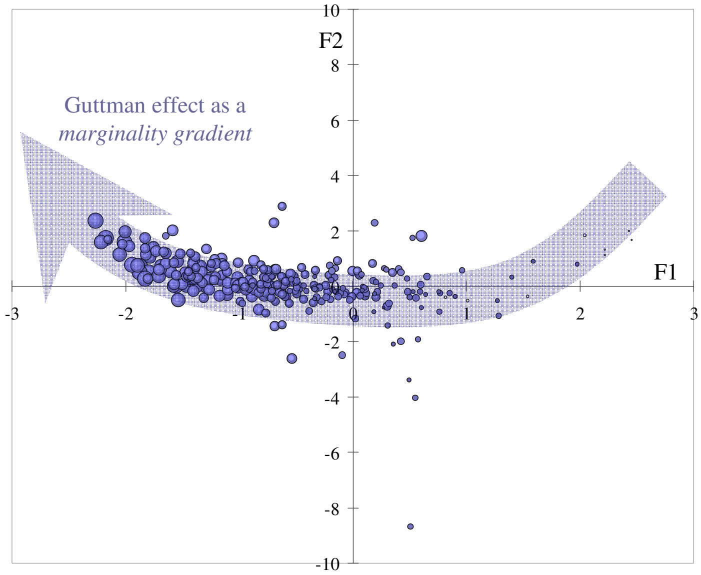

Fig. 7.16 – Village-points in F1-F2 plane (HHs-PEF based FCA)
(circles are proportional to the marginality index M)

In order to identify a possible link between this *marginality gradient* and population, migrants and endogenous marginality, the villages are plotted in F1-F2 (Fig. 7.17) with a size proportional to (i) the number of inhabitants, (ii) the percentage of migrants and (iii) the endogenous marginality.

While Guttman effect may be correlated to the population size (villages at right are more populous than villages at left, Fig. 7.17c), no clear correlation is observed with the proportion of migrants (Fig. 7.17b). However a focus on this latter plot (focus presented in Fig. 7.18) shows that villages with less migrants are all at the left side of the graph and distinguished themselves from the centre of mass because their populations are engaged in *traditional activities* (green axis in Fig. 7.13). This last observation would be a confirmation of the *manifest structural role of remoteness on social space* already mentioned before.

Finally, the plot of the endogenous marginality (M_{endo}) in F1-F2 (Fig. 7.17d) highlights any obvious correlation between M_{endo} and the marginality gradient.

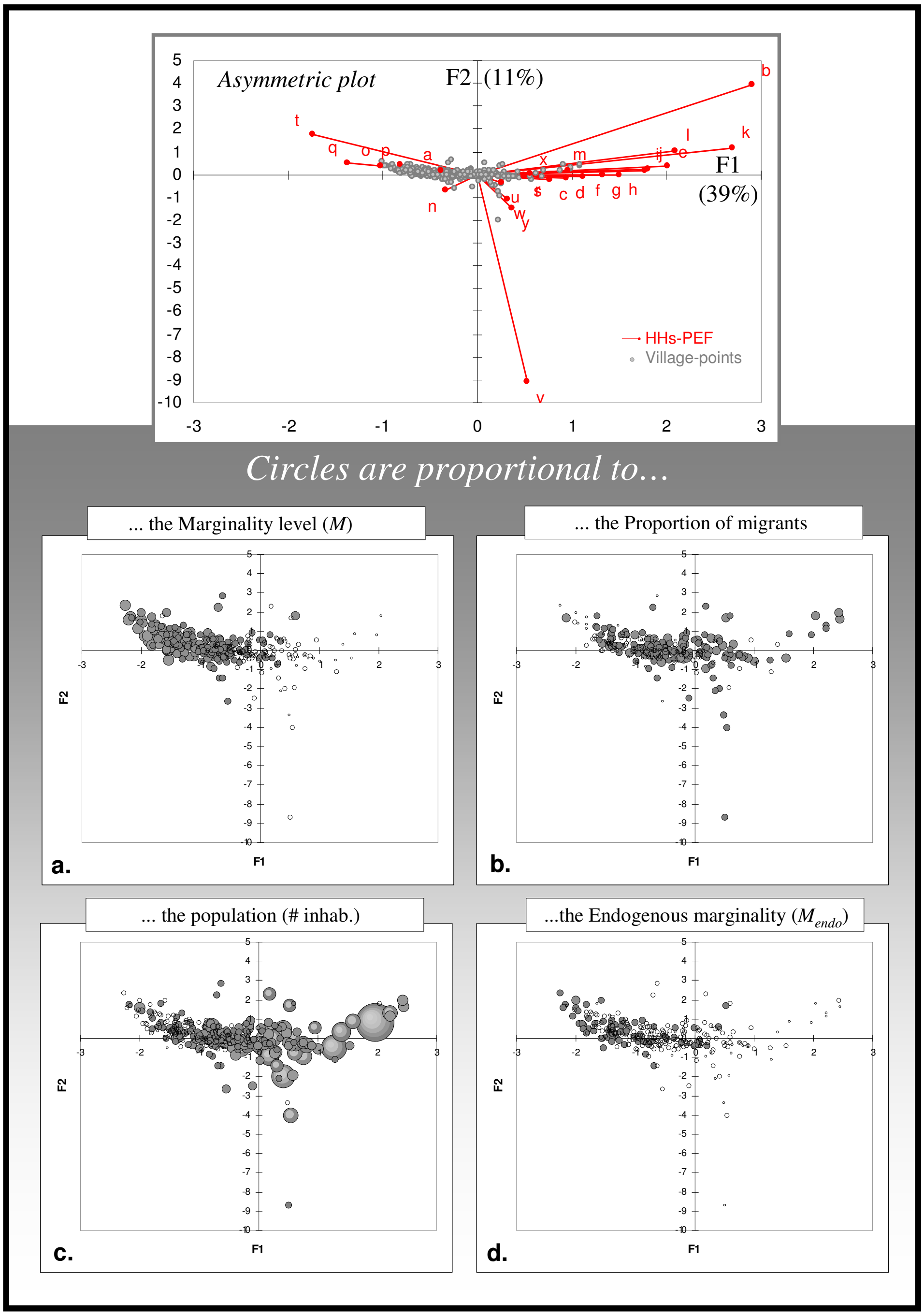

Fig. 7.17 – HHs-PEF based FCA, village-points in F1-F2

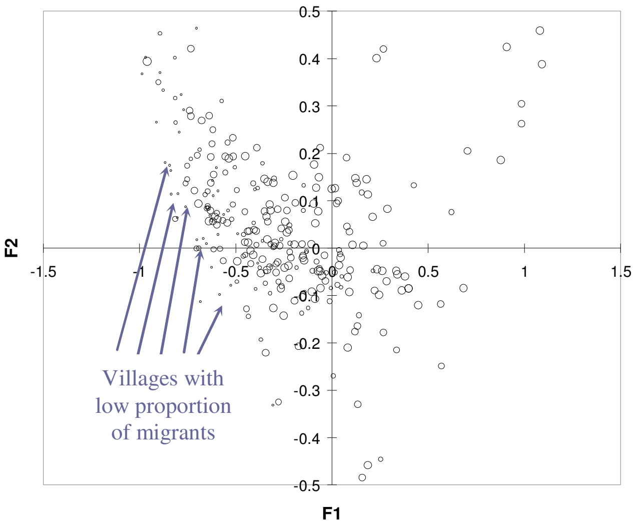

Fig. 7.18 – HHs-PEF based FCA, village-points in F1-F2 (focus)
(circles are proportional to the proportion of migrants)

ii. FCA at individual level (ind-PEF)
Results of FCA at individual level (ind-PEF) are summarized in the figure 7.19. Asymmetric plot shows that the variable *number of Indigenous People* (IP), *solo parent* (SOLOP), *literacy* (LIT10) and *community organization* (COMORG) play a key role in the fact that many villages' profiles are different from the average profile. However, as few variables are available at individual level, these results must be interpreted *relatively speaking*. The random distribution of village-points in the space – constrained by ind-PEF – means that ind-PEF have not a major influence on peculiarities observed in villages. The variation of the size of the circles with the marginality level (*M*), the proportion of migrants (*P_MIG*), the population (*number of inhabitants*) and the endogenous marginality level (M_{endo}) like done at the household level (HHs-PEF) shows the following features:

(i) The villages' profiles at the right side of the graph have higher marginality values. These highly marginal villages' profiles would be mainly influenced – according the FCA results – by the number of Indigenous People.
(ii) The villages' profiles at the left side of the graph have higher proportion of migrants. This is trivial given the position of IP in F1-F2.
(iii) The villages' profiles at the left side of the graph are the most populated. This is to link with the fact that IP villages have often few inhabitants.
(iv) No relevant findings can be observed for endogenous marginality.

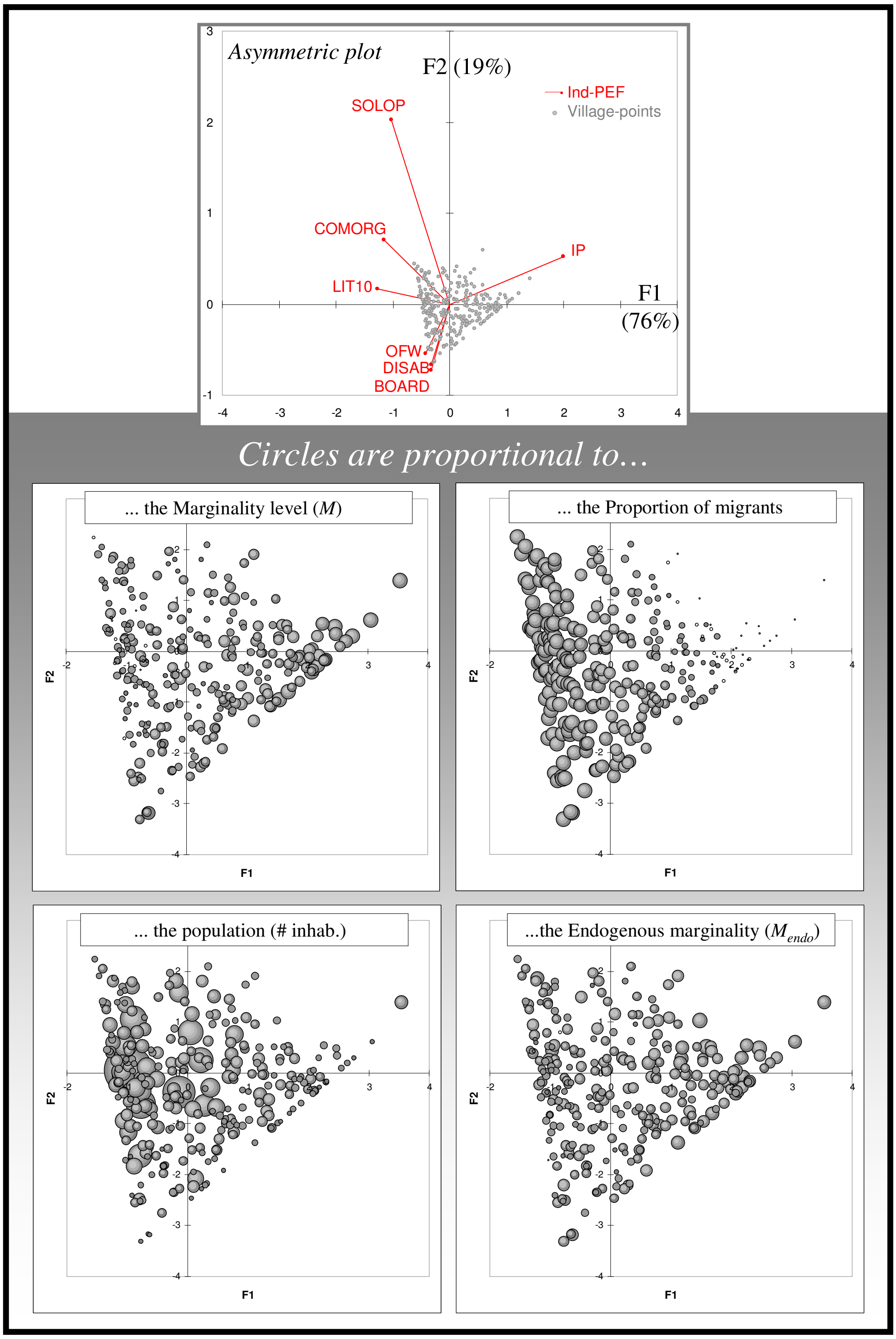

Fig. 7.19 – Ind-PEF based FCA, village-points in F1-F2

iii. FCA at municipal level (muni-PEF)

Muni-PEF-points and municipality-points in F1-F2 are presented in figure 7.20 (standardized by municipal population[111]). The interpretation of these outputs is rather unobvious. No variables appear discriminant for municipality. However, a *quadrant analysis* based on this latter figure could help us to see if municipalities are or are not structured by municipal variables (muni-PEF). The four quadrants are defined by F1 and F2 values as follow: I (F1 > 0 and F2 > 0), II (F1 > 0 and F2< 0), III (F1 < 0 and F2 < 0), IV (F1 < 0 and F2 > 0). The map of the municipalities according their quadrant (Fig. 7.21) does not allow identifying any obvious spatial structure based on muni-PEF.

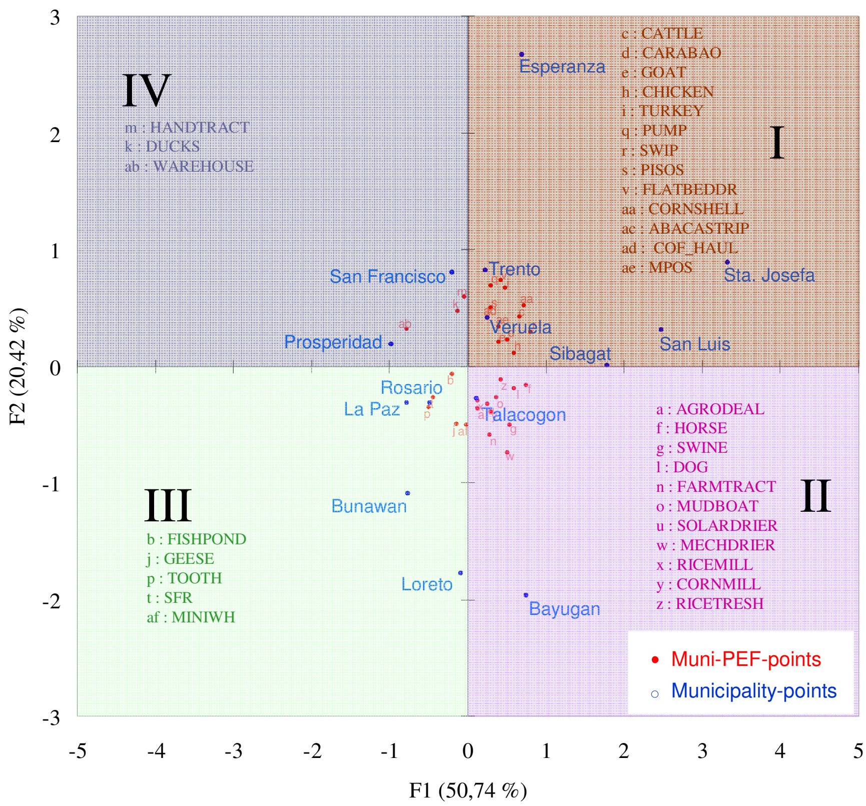

Fig. 7.20 – Muni-PEF-points and municipality-points in F1-F2 plane
Municipal population standardization

[111] A standardization of the muni-PEF based on the total provincial agricultural equipment has been performed without any conclusive results.

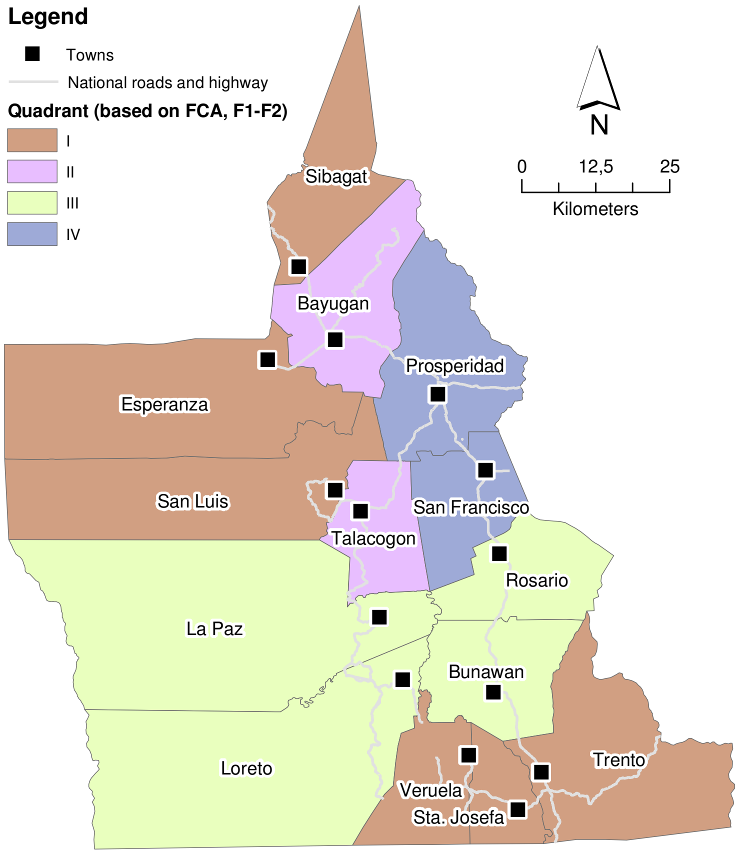

Fig. 7.21 – Municipalities of Agusan del Sur
and their corresponding F1-F2 quadrant (muni-PEF based FCA)

Figure 7.22 presents municipality-points sized by marginality index (*M*). No relevant findings can be observed.

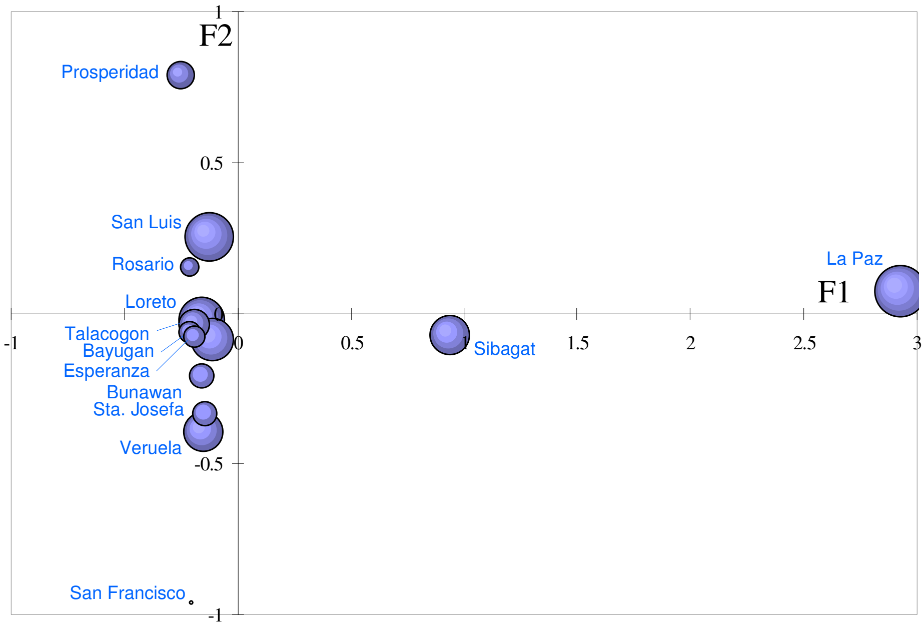

Fig. 7.22 – Municipality-points in F1-F2 plane (muni-PEF based FCA) (circles are proportional to the endogenous marginality index *M*)

iv. FCA with environmental PEF (Envi-PEF)

According to envi-PEF-points and village-points in F1-F2 (Fig. 7.23), Oil Palm Plantation (*h* on figure) plays an undeniable discriminant role. Irrigated agriculture (*f*), rainfed agriculture[112] (*g*) and built-up areas (*i*) also play a key role. Close to the center of mass lies the altered environment (shrubs, grasses, open canopy forest and closed canopy forest[113]). Due to this analysis, a major distinction – also introduce above – may be established between market-oriented activities (and in this case the resulting environments of such activities) and traditional activities.

[112] According to the Bureau of Agricultural Statistics, in 2008 in Agusan del Sur, rainfed *palay* (rice) covers about 25,000 ha. while irrigated *palay* covers 33,500 ha. Their respective yields are 300 t/km² and 410 t/km². Thanks to the rainy climate in Agusan del Sur rainfed agriculture can achieve competitive production level.

[113] As already mentioned (see section *6.1.1.2*), closed canopy forest as surrounded environment of villages is rather fragmented.

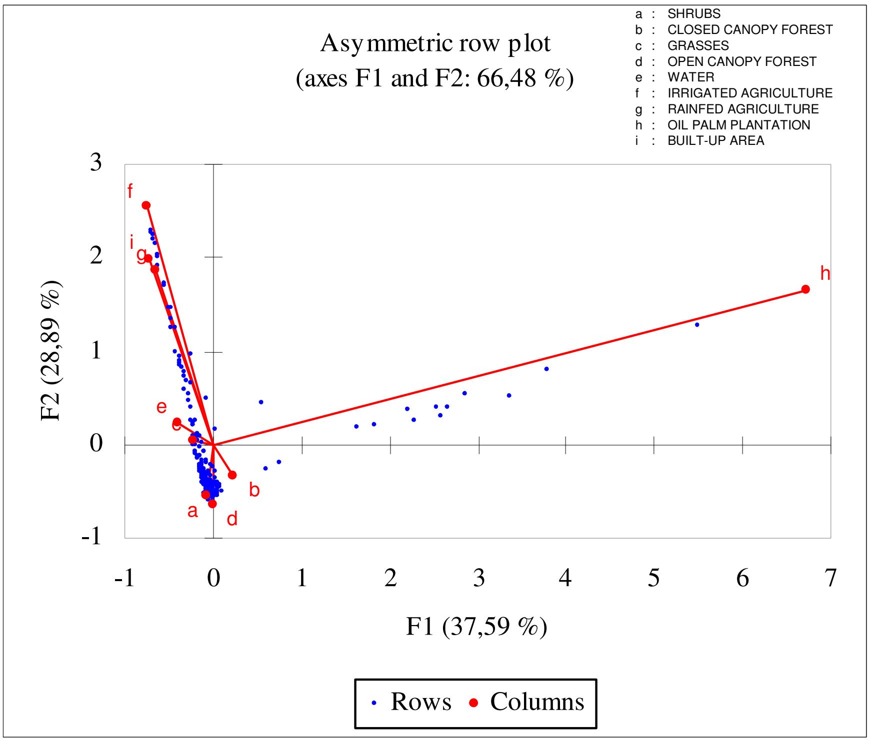

Fig. 7.23 – Envi-PEF-points and village-points in F1-F2 plane

7.2.3 Factorial Correspondence Analysis: a conclusion

Factorial Correspondence Analysis (FCA) aimed to highlight the discriminant variables in terms of marginality at village or municipality levels. This analysis, carried out on all the villages and municipalities from Agusan del Sur Province, required to work with four different types of potential explanatory variables depending on the fact they relate to households, individuals, municipalities or the environment.

FCA using variables related to households reveals a curvilinear relationship (Guttman effect). Specifically, three groups of discriminant variables are identified - (i) material goods, (ii) traditional activities, and (iii) market activities. We name *materiality*, *traditionality* and *market opening* those three discriminant directions. A gradient of marginality appears clearly linked to the emphasized curvilinear relationship: the villages with the highest marginality level would be oriented toward a certain traditionality, the villages with the lowest marginality level would be oriented toward a certain materiality.

FCA using variables related to individuals shows that two elements are particularly discriminant: the proportion of solo parents and the proportion of indigenous people

(IPs). We have also had confirmation that villages with a high marginality are strongly associated with a significant proportion of IPs.

At the municipal level, no variable is particularly discriminating.

The analysis using variables related to the village's surrounding environment indicates that the presence of oil palm plantations is clearly discriminatory. In other words, some villages have a profile different from the average profile because they are located close to a plantation. However, this proximity to the plantations is not correlated to a particular level of marginality (neither high nor low).

7.3 Explanatory geostatistical analysis: a conclusion

The consideration of the spatial autocorrelation, through Local Indices of Spatial Association (LISA) and the Factorial Correspondence Analysis (FCA) have been performed in this chapter as explanatory tools for the identification of marginality factors. While these two analyses confirm that the marginality mechanisms are complex – the provincial geostatistics being deeply entangled – and show that no particular variables from our database appears as really determinant in regard to the marginality level, several findings have been emphasized. On the one hand, the *village's neighbourhood* as well as the *relative remoteness* – highlighted through LISA – appear as two key geographical factors that can explain the observed marginality of a given village. On the other hand, it appeared – through FCA – that the differences among the villages' profiles were mainly determined by three groups of variables (*materiality*, *traditionality* and *market opening* being considered as discriminant situations).

Chapter 8

Conclusions, Discussion and Perspectives

The first part of this chapter aims to give the reader a succinct view of the philosophy and key features that have guided this research. After reviewing the main outputs, it presents the empirical findings and highlights some theoretical geographical concepts intimately related to the migration-marginality nexus. The strengths and limitations of the study are then discussed before some research perspectives are proposed.

8.1 Foundations

As human migrations represent a real strategy for survival and as poverty remains one of the most important issues in the world, we decided to look at migration-poverty interactions. We specifically focused on rural areas as in-migration zones with a view to identify, at the local level, the role of in-migration on an observed development. As earlier mentioned, Ng said that "the future of research into patterns of internal migration in Southeast Asia seems to lie in studies of limited scale, in selected localities and with restricted analytical aims" (Ng, 1975, p. 189). As a consequence, we opted to conduct a local study rather than a regional one. The analyses were performed within the province of Agusan del Sur in the island of Mindanao (Philippines). Indeed this province has experienced massive in-migration for several decades. The migration mechanisms during the 60s and 70s are known while the recent dynamics are much more unclear. It was therefore interesting to study this province to understand the recent demographic and the related spatial dynamics. Moreover the province of Agusan del Sur being one of the poorest provinces of the Philippines constitutes a potential case study to highlight possible poverty-migration relationships.

As no cross-temporal data were made available at a sub-provincial scale, we were forced to limit our study to the *relationships existing today* between in-migration and poverty (rather than an impact study).

8.1.1 An index of marginality, what for?

We started our research about poverty with a perspective much broader than a strict economic one. The literature review revealed that, besides well known poverty indices, there were indicators of marginality. The marginality concept incorporating the spatial, socio-political and economical dimensions are deemed very appropriate to consider given the precarious situation of Agusan del Sur. "Marginality focuses on the rationale behind spatial, economic and social disparities (...) in the light of legitimacy, equity and social justice" (Gurung and Kollmair, 2005, p.18). We therefore used an index of marginality, a synthetic index constructed from 13 socio-economic variables through a PCA analysis. This synthetic index corresponds to the first axis of the PCA.

8.1.2 Does an endogenous marginality exist?

The mapping of the marginality index at the sub-provincial scale revealed immediately several important structural features such as the highway or the topography. An analysis of the influence of remoteness, defined as the distance to urban centres taking into account the topography and the type of roads existing, on the marginality level confirmed the structural key role of these elements. A first important conclusion, perhaps unsurprisingly, emerged: *remoteness does matter*. This led us to consider the possible existence of marginality factors intrinsic to the place, remoteness free. An index of *endogenous marginality* has been defined as the residual of a model expressing marginality as a function of remoteness.

8.1.3 In-migration as a key marginality factor?

While remoteness remains a strong explanatory factor for understanding the spatial heterogeneity of marginality, we explored another dimension: the population and the proportion of in-migrants. We assumed that the more a village is populous, the more it may be integrated into a provincial socio-economic dynamic. Indeed, a populous village has more potential connections with the local economic centres and potentially more capacity, in particular through its important human capital, to be less marginal[114]. The proportion of in-migrants explains 15% of the variance of the index. Isolation, population and the proportion of in-migrants account for 63% of the total variance, which means that two thirds of the marginality phenomenon is explained by these three factors.

8.1.4 Does Environment matter?

It is obvious, in addition to the demographic factors, to pay attention to the environmental factors. While the environment of Agusan del Sur Province was almost intact one century ago, today it is very anthropized. This simple observation led us to suspect the existence of strong links between marginality, migration and environment. Forest cover being in part explained by the elevation, and the latter explaining in part the marginality level, we observed a vertical stratification of marginality. These phenomena - land use, topography and marginality - are intimately entangled and it was presumptuous – even unjustified – to try to achieve a complete model of marginality integrating environmental factors, in addition to remoteness and demographic factors. Therefore, we focused on a correlation analysis convinced that the environment plays a key role in the migration-marginality nexus. In-migrants have undoubtedly exploited the natural resources intensively higher than the local indigenous populations with a strong agricultural perspective.

8.1.5 Do scale and marginality factors play any cumulative effect?

It is common that an observed factor at a given geographic scale (e.g. at the municipal level) occurs at a higher geographical scale (e.g. at village level). In the case of Agusan del Sur, the existence of provincial and municipal factors has been explored. An analysis at both levels has shown that local economic activities and/or the level of infrastructural development are closely linked to the level of marginality. However we were unable to formally identify endogenous factors of marginality.

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[114] Oliveau (2004) talks about *own centrality* of villages (*centralité propre des villages*).

The observed factors of marginality may also have cumulative effects. For instance the remoteness of a village may explain its small size in terms of population, which may explain the low proportion of in-migrants and also explain the low rate of agricultural infrastructure, etc. We realize that and intensification processes between these factors may exist.

8.2 Are the objectives of the study met?

At the beginning of this study, we had identified the general and specific objectives linked to the research question. At the end of this study, all the specific objectives have been achieved as evidenced by the summary presented in table 8.1 hereafter. The achievement of these specific objectives leads us to assert that the general objectives – (i) to contribute to a better understanding of the impacts of internal in-migration on the marginality within a rural context, and (ii) to investigate how spatial analysis techniques and tools can be used to identify structures and dynamics of such a phenomenon – are therefore largely achieved. Beyond, the study has opened doors for research perspectives and recommendation which are developed in the next sections.

Specific objective 1 To have a deep understanding of the global socio-economic and environmental context
• *Q1.1 How have socio-economic and environmental contexts evolved for recent decades?*
• *Q1.2 What are the observed social changes during these last decades?*
Literature review, basic analysis of provincial statistics and interviews with key people allowed us to understand the present socio-economical and environmental situation of Northern Mindanao, Agusan del Sur Province in particular, as well as their recent evolution.
Specific objective 2 To investigate the concept of marginality
• *Q2.1 What is marginality?*
• *Q2.2 Are there several types of marginality?*
Human development literature review led us to make a clear distinction between marginality and poverty. Marginality is driven by three type of isolations (economic, socio-political and spatial). Several types of marginality have already been suggested by authors. In our study we focused on two types : marginality (M) and endogenous marginality (M_{endo}).
Specific objective 3 To develop statistical techniques for assessing marginality levels
• *Q3.1 What is the level of marginality within the province?*
Poverty is usually assessed through poverty indices, often a combination of socio-economic indicators. Marginality, a rather new concept in development studies, is not measured directly by official censuses. By applying a Principal Component Analysis (PCA) on community-based statistics (CBMS) at the village level, an index of marginality (M) was built up.
Specific objective 4 To identify and analyze the spatial distribution of migration and marginality
• *Q4.1 Where are the in-migrants located in the province?*
• *Q4.2 What are the driving factors of their in-migration?*
• *Q4.3 Is there any spatial structure in the in-migrants distribution?*
• *Q4.3 Is there any spatial structure in the marginality level distribution?*
The mapping of CBMS data complemented with information from our field surveys allowed to assess (i) the in-migrants distribution within the province, and (ii) the marginality level for each village. Visual analysis of output shows that the in-migrant distribution as well as the marginality level have specific spatial structures. Remoteness (i.e. the spatial isolation from towns and roads) appears rather obviously to have an influence on the marginality phenomenon.
Specific objective 5 To identify, through statistical and spatial analysis, the potential driving factors of marginality
• *Q5.1 What are the driving factors of the observed marginality?*
• *Q5.2 What would be possible mechanisms of marginality in the Agusan del Sur context?*
Regression analyses based on socio-economical data show that remoteness, the presence of migrants and the population size are three major marginality factors. Multi-scale correlation analyses as well as the use of explanatory geostatistics tools (LISA and FCA) allowed to identify other local potential marginality factors.

Table 8.1 – Specific objectives of the study, a synthesis

8.3 Empirical findings

Many empirical and theoretical features are known about the motivations to migrate in many parts of the world and their impact on multiple levels. By focusing on the identification of the links between migration and marginality within a rural environment, this research has emphasized the complexity of the studied phenomena. One of the thesis objectives was to see if the dynamics between migration and marginality reported in the scientific literature were also observed for the province of

Agusan del Sur. In this section we therefore **resume the main findings by comparing the expected characteristics** (from the scientific literature) **to those observed in Agusan del Sur** (i.e. the empirical findings of this thesis). The comparison is done for (i) the driving factors of in-migration, (ii) the observed impacts and (iii) the factors of marginality.

(i) driving factors of in-migration (Tab. 8.2)

Legend: Observed in Agusan del Sur; Not observed in Agusan del Sur; No sufficient elements; Mixed results

	Expected factors (scientific literature) and the corresponding author(s)		Observed in Agusan del Sur (thesis)
Motivations to migrate			
Pull factors	employment	Bogue *et al.* (1957)	**Yes**. Most of migrants come to "find a (new) job".
	natural capital	Goodrich (1936)	**Yes**, indirectly. High natural capital (forest, soil fertility) of ADS constitutes a major pull factor.
	high living standard at destination	Toya *et al.* (2004)	**No**. In ADS living standard is low.
	education and services	Pernia (1974)	**No** except for a few individuals who migrate to be close to high school.
	presence of relatives	Pernia (1974)	**Yes**. Presence of relatives is a major pull factor expressed during survey.
	demand for export oriented rural products	Ranga (2006)	No sufficient elements.
	efficient road network and access to resources and markets	Winkels and Adger (2002)	No sufficient elements.
	increasing of utility	Zohry *et al.* (2002); Faust *et al.* (2003)	**Yes**. Migrants come in ADS to improve their livelihood and, in consequence, to increase the household's income.
	Labour-intensive manufacturing, construction and services in rural areas	Deshingkar (2006)	**Yes**. Traditional activities are correlated to IPs while services, construction (and trade) are correlated to migrants.
Push factors	poor living conditions at the origin		**Yes**, but intrinsic to most of human migrations.
	unemployment at the origin		**Yes**. Most of migrants come to "find a (new) job".
	population growth at the origin		No sufficient elements.
Others	distance between origin and destination	Zipf (1976); Lewis (1982); Etzo (2008)	**No**. Distance does not seem to be a brake to migrate to ADS. An important proportion of migrants come from outside Mindanao.
	size and density of population	Pernia (1974)	**Yes**, indirectly, as the land availability (which is a notable pull factor) is linked to the population density.

Table 8.2 – Expected motivations to migrate vs. observed results

(ii) impacts of in-migration (Tab. 8.3)

Legend		Legend	
(green)	Observed in Agusan del Sur	(grey)	No sufficient elements
(orange)	Not observed in Agusan del Sur	(hatched)	Mixed results

	Expected impacts (scientific literature) and the corresponding author(s)		Observed in Agusan del Sur (thesis)
Impacts of in-migration			
	population growth		**Yes**, intrinsically. Population in ADS grows from 38,000 people in 1948 to 609,000 in 2007. This growth is largely explained by immigration.
	emergence of non-farm jobs	Peker (2004)	**Yes**. With the development of towns, secondary and tertiary sectors expanded.
	diversification of the activities	Peker (2004)	**Yes**, but not for all the population. Indigenous People seem to keep traditional activities.
	changes in access to land	Ostrom *et al.* (2000); Homewood *et al.* (2004); di Balme (2006);	No sufficient elements.
	new technologies disrupt the performance of existing systems	Ostrom et al. (1999); McNally *et al.* (2002)	**Yes**, in a sense. Traditional (ancestral) systems are completely disrupted by the arrival of commercial plantations and logging, justifying the implementation of CADCs to preserve the IP community.
	agriculture intensification	Araki (2005); Cruz (1984)	**Yes**. Farming equipment in ADS sharply increased during the 70s and the 80s.
	degradation of natural resources	Cruz (1986); Kummer (1992); Magdalena (1996); Lohrmann (1996); Black and Sessay (1997)	**Yes**. Several degradations have been reported and observed (water pollution, massive deforestation, illegal logging and mining, etc.)
	population standardization	Stark *et al.* (1976); Adams (1986); Rodriguez (1996)	It depends. In terms of living standard, most of people in ADS are still poor and no real differences are observed. In terms of ethnicity, heterogeneousness is observed.
	imbalance in sex ratio	Deshingkar and Grimm (2004)	No sufficient elements.
	conflicts between migrants and natives	Doevenspeck (2004); Homewood *et al.* (2004)	**No**. Conflicts however are reported but involving armed groups and national army. Abuse of identity is also reported (acts of violence are committed by using the identity of a group or migrants' poses as IP leader (*Boholanos* datu) (Walpole, personal communication).

Table 8.3 – Expected impacts of in-migration vs. observed results

(iii) factors of marginality (Tab. 8.4)

Observed in Agusan del Sur	No sufficient elements
Not observed in Agusan del Sur	Mixed results

	Expected factors (scientific literature) and the corresponding author(s)		Observed in Agusan del Sur (thesis)
Factors of marginality			
	Fuzzy effects of population size on poverty level : population size may be positively or inversely correlated to poverty	Mauro (1995); Barro (2001)	Population size is negatively correlated to marginality.
	Antagonistic effects of in-migration on poverty : diffusion, collaboration or competition.	Doevenspeck (2004)	In-migration rate is inversely correlated to marginality level. An explanatory phenomenon would be the amplification of the local social networks.
	In-migration as a factor of deforestation	Black and Sessay (1997); Hugo (2008)	**Yes**. High in-migration rates are correlated to deforested environment. In such areas however the marginality level is low.
	Antagonistic effects on poverty of modernization in agriculture and technology-oriented agricultural projects.	Jalan and Ravaillon (1997); PPLPI (2008)	Modern agriculture, like irrigated agriculture, is correlated to low level of marginality.
	Irrigation brings a range of benefits to individuals and households.	Shah (1993); Hussain and Hanjra (2004)	
	Off-farm activities are a way to get out of poverty.	Taylor (1981); FAO (1998); van de Walle and Cratty (2004); Man and Sadiya (2009)	**Yes**. Diversification of activities is frequently reported in the province.
	Livestock has a positive impact on household income.	Maltsoglou et Rapsomanikis (2005)	No sufficient elements.
	High dependence rate of extreme poor upon livestock.	ILRI (2002) *in* Otte *et al.* (2009)	No sufficient elements.

Table 8.4 – Expected marginality factors vs. observed results

8.4 Theoretical findings

Below, we present the main theoretical findings (concepts) highlighted through the thesis.

8.4.1 Marginality

The relatively new concept (early nineties) of *marginality* appeared to be adequate to study precarious situations such as observed in Agusan del Sur. Its mapping provides a synthetic vision - by definition – of levels of poverty and isolation (both *spatial* and *social and political*). Soon we saw the emergence of structural elements (roads, urban centres, topography). As these elements do not alone explain the entire observed variability, a concept of endogenous marginality was introduced. However, this concept, although correctly defined according by us, has not yielded satisfactory results. In this respect, recommendations are made hereafter (see Section 8.7).

As mentioned in the literature review (section *2.2.2.1*), Mehretu *et al.* (2000) propose a typology of marginality. The authors propose two spatial patterns for (i) contingent marginality and (ii) systemic marginality. In the first case the form is described by "distance-decay functions of (…) development indicators (…) declining over distance from the centre of growth [and] may be distorted by local environmental, cultural and economic limitations". In the second case the form "tends to be more discontinuous with significant truncation" (Mehretu *et al.*, 2000, p. 96) (Fig. 8.1).

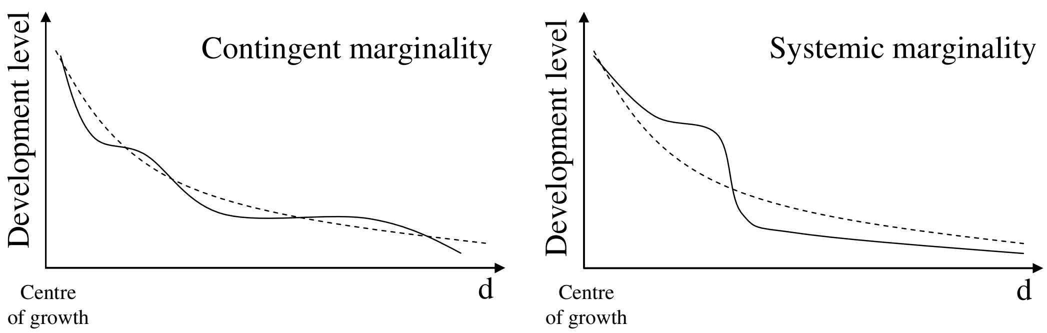

Fig. 8.1 – Spatial patterns for contingent and systemic marginality.

What spatial patterns of marginality do exist in Agusan del Sur? In the province, there are multiple centres of growth, the four main centres being certainly the following towns: Trento, San Francisco, Prosperidad and Bayugan. And the highway, in a sense, may constitute itself a line of growth. Although our data are not spatially continuous, a transect of development level – the opposite of the marginality level[115] – may be realized from these centres[116]. Empirical transects are shown in figure 8.2: A-A' crossing Bayugan, B-B' crossing Prosperidad, C-C' crossing San Francisco and D-D' crossing Trento. The decrease of development level with the distance from highway (corresponding to an increase in the marginality level), particularly obvious through transect B-B', suggests that a global *contingent marginality* pattern is present in the province. Significant truncations are also observed in some transects suggesting a local *systemic marginality*.

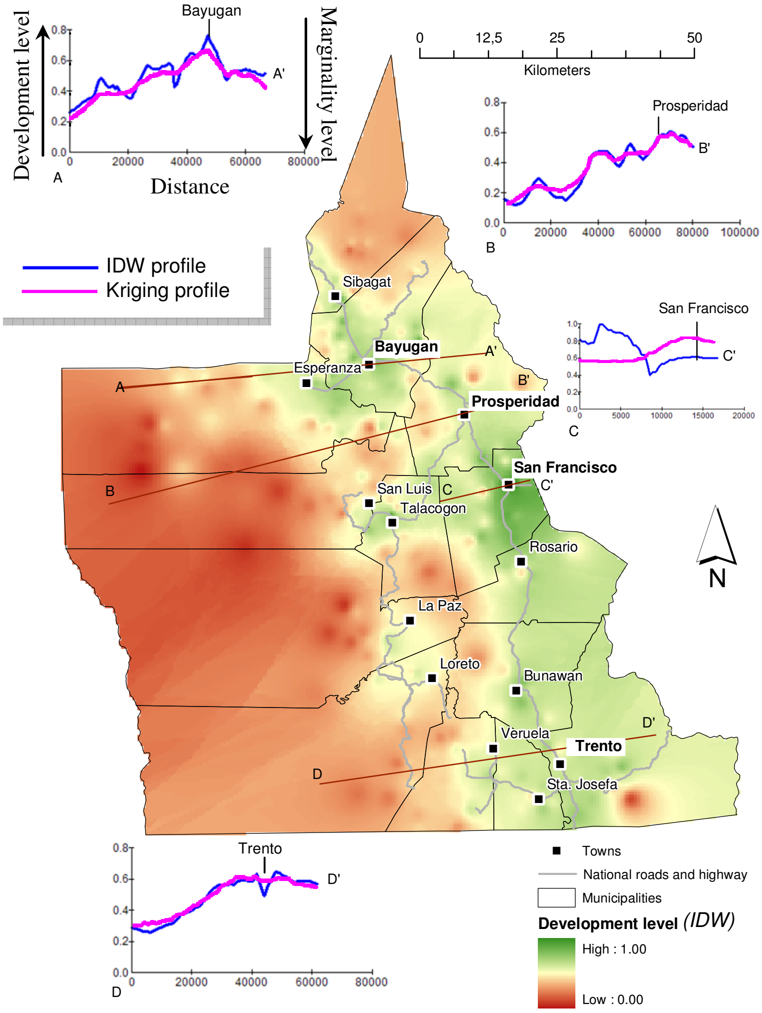

Fig. 8.2 – Marginality profiles of Agusan del Sur

[115] Development level is defined as 1-M. The highest development level corresponds to the lowest marginality level.
[116] We use interpolated data (Inverse Distance Weighted (IDW) method) to build a continuous image of marginality level. In figure 8.2, profiles based on kriging interpolation method are also mentioned. The comparison of the two profiles (IDW and kriging) shows that results are very dependant of the choice of the interpolation method.

From these observations, we propose a schematic view of spatial patterns of marginality in the case of Agusan del Sur (Fig. 8.3). Even if the objective of the thesis was not to describe all the marginality patterns, it appears that a systematic analysis of spatial forms of marginality in marginalized remote rural areas could help to identify new patterns possibly not identified in the work of Mehretu *et al.* and/or better understanding the factors leading to such spatial patterns[117].

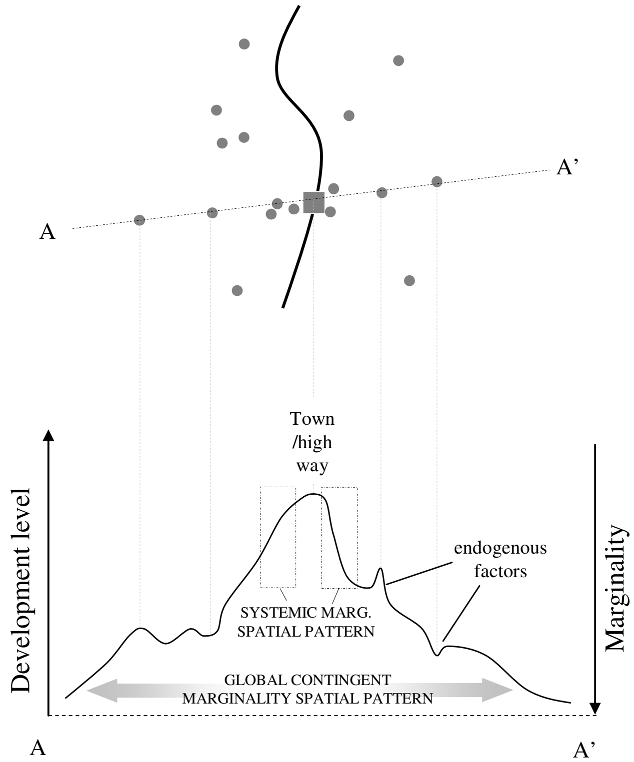

Fig. 8.3 – Schematic view of spatial patterns of marginality observed in Agusan del Sur

The decrease of development level, as we go away from town or highway, is well understood. It is corresponding to a spatial pattern driven by the dynamics of the free market (*contingent marginality*). In Agusan del Sur, towns as well as highway are considered as two major market places. However, significant truncations that would be observed in some transects would suggest the presence of local barriers to the villages' development[118]. Regarding the profile's irregularities they would suggest the presence of endogenous factors of marginality.

[117] Indeed Mehretu *et al.* (2000) have not studied marginality patterns in remote rural areas their work being mainly focus on classical *core-periphery* economical structures.

[118] Among potential local barriers to development: land ownership imbalance, low level and efficiency of physical infrastructures (roads, electricity, etc.), political corruption, inefficient production decisions, etc.

8.4.2 Isolations and marginality

Isolation has been a fundamental element in our study. The spatial isolation and social and political isolations are two dimensions of marginality. It emerged from our empirical study that the spatial isolation (remoteness) determines – above all things – the level of marginality.

The importance of remoteness is not new and geographic studies are intrinsically concerned by this. However, often the spatial isolation is reduced to the distance to centres (urban centres, markets, etc.). This study shows that other dimensions could be introduced through GIS (topography, type of road). Similarly, the *relative remoteness*, that is the isolation of a village from its neighbours, has been mentioned as a potential marginality factor, beyond the isolation from local markets.

Additionally the joint analysis of the remoteness and the patterns of marginality (contingent and systemic marginality) may also help to identify potential barriers to development not linked to spatial isolation.

An attempt to subtract the effect of remoteness has led to the proposal of the concept of endogenous marginality. Beyond the spatial isolation we expected to find clear endogenous factors and be able to gauge the influence of social and political isolations. The study did not allow to strongly establish proved links. Nevertheless, it opened doors for research perspectives (see 8.6).

8.4.3 Neighbourhood

Neighbourhood is an important concept especially in the study of rural areas where the distance to the nearest market or villages is important in all-days life of local populations. The spatial distribution of villages in the province of Agusan del Sur is certainly not homogeneous according to historical and geographical factors (topography, vegetation cover, infrastructure, etc.). A village may be isolated from an economic centre but less isolated from its neighbours (important neighbourhood density), that support strong social connections. Conversely, a village close to an economic centre may be relatively isolated from its neighbours (low neighbourhood density) and therefore may possibly present an important social and/or political isolation (Fig. 8.4).

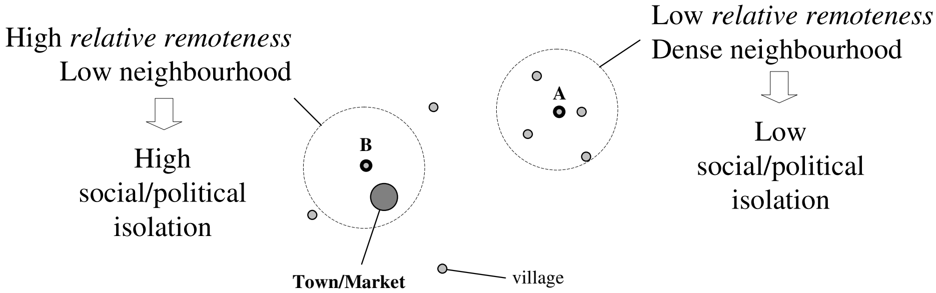

Fig. 8.4 – Neighbourhood as a factor of social/political isolation

8.4.4 System

Agusan del Sur Province has been a real *geographical laboratory*. The province is the mirror of phenomena far beyond the provincial borders. In this sense, Agusan del Sur has been – and still is – the photosensitive paper on which are sketched the phenomena studied by a geographer. Much more than elsewhere, one can see the scars of globalization (commercial plantations, deforestation) and their (positive and/or negative) impacts on population. In a resulting plural multichotomic[119] space, the geographers must first identify then further study the *problematic interactions* in this geosystem. With a systemic point of view, we propose, from our multivariate and multilevel analyses, a chorematic[120] map of Agusan del Sur (Fig. 8.5). This synthetic map emphasizes – at the provincial level – the structural features of development, the structural features of marginality and the resulting spatial structures.

[119] Multichotomic in the sense that each sub-space can have its own path of development.
[120] A *choreme* (Brunet, 1986) is a schematic representation of an area aiming to take into account the dynamics present in the study area.

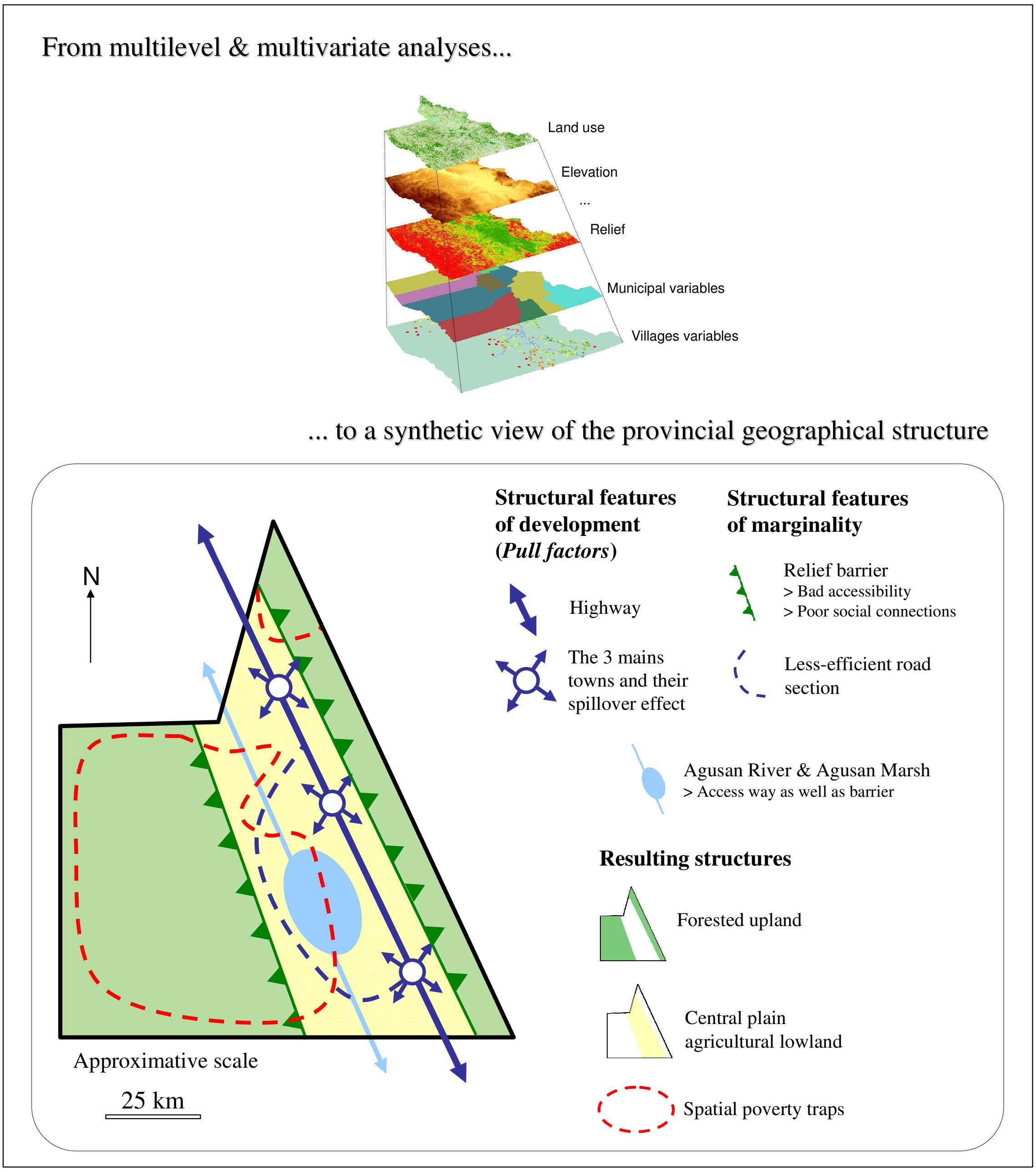

Fig. 8.5 – Chorematic map of Agusan del Sur

8.4.5 Geographic factors for development

To conclude this section about theoretical findings, it was interesting to emphasize the contributions of the thesis in the theory of development.

Theories of development have highlighted multiple factors that can promote the development of a region. Among these theories, we will retain in particular ones with a *dualistic vision*. Some authors have referred to the dualism in the social and economic structures (particularly the opposition between *traditional* and *modern* social organization, the coexistence of an *autosufficient sector* and a *market- oriented economy*) (Boeke, 1930, 1953, Lerner, 1962; Gannagé, 1962), the technical dualism (contrast between areas using traditional tools and those using modern technique) (Geertz, 1963) or the regional dualism (dualism in the spatial organization) (Williamson, 1965; Thorbecke and Santiago, 1984).

In this study, a **duality** between *traditionality* and *modernity* has been clearly demonstrated, especially through the factorial correspondence analysis.

However, development studies for decades have been heavily influenced by a neoliberal vision, in particular through reports from the World Bank. More recently, the geographic approaches of development have highlighted the a-contextual character of spatial analysis conducted in numerous studies. Such studies often advocated neoliberal political options and had taken few accounts of differences in socio-political contexts[121] (Martin, 2003). Today, the existence of **geographical development factors**, confirmed through this thesis, is unmistakable[122]. The distance (and therefore isolation or proximity), density (population, infrastructure, etc.), the environment, migration flows, etc. are the many factors that may partly explain local development failures.

[121] In the standard location–theoretic economic models, "socio-political context is *held constant*, that is, ignored" (Martin, 2003, p.79).

[122] The recent World Bank's annual World Development Report (Banque Mondiale, 2009) even seems to show that geographical economy has incorporated this idea by adding a spatial (and contextualized) dimension in its analysis. However, the vision of development according to the World Bank (although improved by a more multidisciplinary approach) remains questionable, according to us, on many points (in particular the concentration and agglomeration as a necessary step to the development or the assumption that the development trajectories experienced by Northern countries should occur in the South) (see also Giraut (2009) and Van Hamme *et al.* (2010) for a critique of the 2009 World Bank report)

8.5 Strengths and weaknesses of the methodology

The methodology developed in this thesis – aiming to understand the links between internal migration and marginality – shows both advantages and disadvantages.

8.5.1 Local communities' cooperation

The integration of local communities is increasingly advocated in any scientific study. Participatory approach aims to incorporate the knowledge and opinions of people in the planning and management of development projects and programs (Michener, 1998). This approach has the advantage of integrating the local perceptions, increasingly fundamental to understand people-environment relations particularly in poor rural areas. More top-down rural development strategies have generally not succeeded in raising living standards among the rural poor. It is argued that "inappropriate development strategies have stemmed from methodologies that fail to appreciate the whole picture in rural communities, and in particular ignore local people's perceptions, needs and understanding" (Binns *et al.*, 1997, p.1). Participatory Rural Appraisal (PRA) (Chambers, 1992) represents a significant step forward in the design of methodologies to promote rural development in poor areas. Initially, we developed a methodology to assess the differences in priorities between migrants and indigenous people. Strictly speaking, we can not say that this study was participatory. We actually conducted interviews and surveys. However, local communities did not receive the results yet and these results have not been incorporated into the government programs. Indeed, they require more validation (see Section 8.6 hereafter). Local knowledge has been integrated as possible in our study. This study can claim to be a *first step* towards the establishment of policies and programs for a more participatory development (see Section 8.6).

However some difficulties may be met with the information gathering from local communities – as it has been the case in our study. For instance we experienced information filtering (conscious or not[123]) or translation difficulties braking discussions. It has been difficult to get sufficient relevant answers for several questions. Moreover, in some areas of the province, it has not been possible to interview local community due to Peace & Order problems.

8.5.2 Small scale and multi-scalar analysis

The spatial variability of the marginality phenomenon has been highlighted through the use of data at the village scale (barangays). This was possible thanks to the Community-Based Monitoring System (CBMS) data acquisition but also by the location of about 300 villages throughout the province (data provided by ESSC). Small

[123] For several personal unpredictable reasons, local people do not share information about them or modify it.

scale analysis allows the identification of local spatial structures in the studied phenomena.

The understanding of the marginality mechanisms has gone through a multi-scalar analysis (Fig. 8.6). Indeed, we used data at several scales: provincial, municipal or local (village), each scale being used to identify specific factors. The spatial aggregation/disaggregation was used to avoid any bias in the development of our models and during our analysis of correlation.

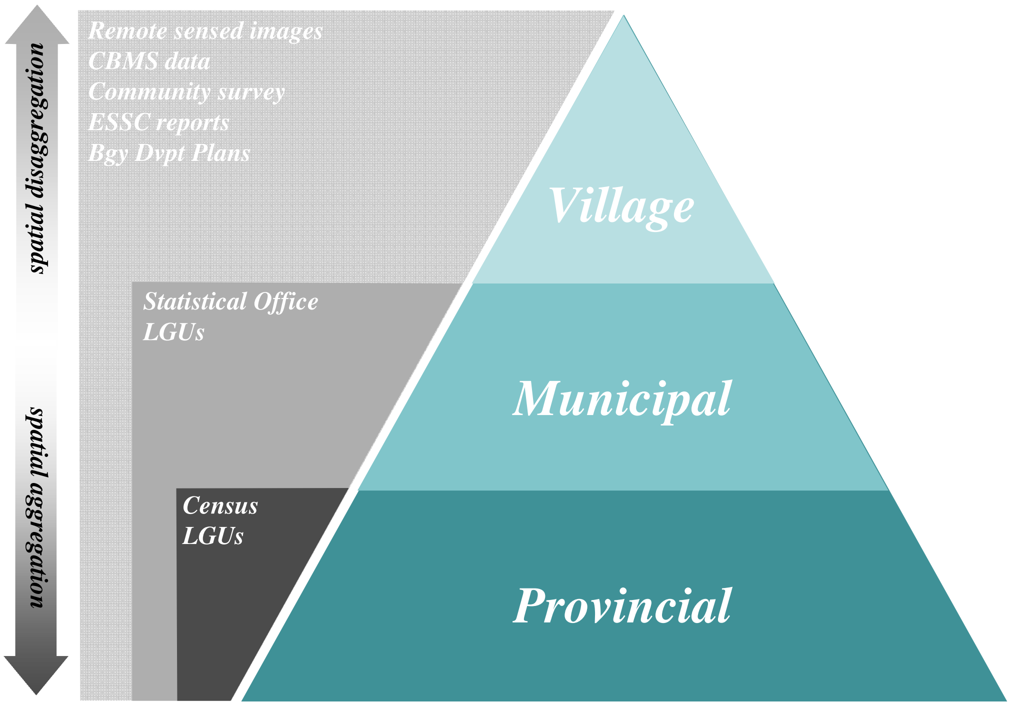

Fig. 8.6 – Multi-scalar analysis and data used

8.5.3 Neighbourhood

In our study, we used the local indices of spatial association (LISA) to account for spatial autocorrelation in the marginality phenomenon. We opted for the use of a *k*-nearest neighbourhood. This method has the advantage of fixing the same number of neighbours for each analyzed point, which does not allow the neighbourhood to be defined by contiguity or distance. Limitations of the method of nearest neighbours are, however: (i) the neighbouring points are taken into account regardless of their distance to the central point and they are not weighted by the distance and (ii) the isotropy is not ensured (Oliveau, 2004).

8.5.4 Village delineation and purok location

GIS database has been the major tool to conduct spatial analyses. The accuracy of spatial entity locations depends on the digitalization process. The village territory corresponds to a surface and, in the database, has been digitalized as a point. Numerous villages do not have any delineation. Each village is composed of puroks for which we have no digitalization. All these technical limitations did not allow us to analyze situations at a sub village level or boundary-linked concerns. *Undelineated situations* may lead to overlapping concerns.

8.5.5 A biased view of migration

As mentioned in the literature review, migration has many faces, both in terms of motivations and patterns. Therefore, an in-migrant who arrived in the province 30 years ago did not have the same expectations and/or incentives than a person who arrived in the last 5 years. Similar observation may be done about permanent and seasonal/temporary migrants. Using a *proxy* variable (non-IPs as migrants) for the statistical analysis, we could not inherently consider and analyze these many aspects of migration. The social survey has touched on some dimensions but no general conclusions may be drawn.

8.5.6 Social and Political isolation

By definition, social and political isolation is a component of marginality. *Social and political isolation* situations influence various poverty indicators and *social and political isolation* is diluted in the marginality index by construction. We gathered few relevant data about political participation of local populations[124]. Any assessment of social and political isolation has not been possible within Agusan del Sur. Social and political isolation has probably been touched through the endogenous marginality index but did not prove anything at all.

8.5.7 Crucial lack of data

The main limitation in this study has been the lack of detailed and validated data about migration and marginality. Already mentioned by Ng in 1975, “the lack of reliable statistics for analysis is perhaps an even greater problem confronting the student of Southeast Asian internal migration. (…) The lack of accurate registrations rules out the possibility of methods of estimating migration” (Ng, 1975, p.189).

As no cross-temporal data were made available at a sub-provincial scale, we have studied the *present situation* and the relationships existing today between in-migration

[124] The sole information gathered concerns the number of registered voters by municipality for elections in 2004. From municipal population in 2000 we approximate the participation rate for each municipality. No relevant correlation has been observed between this rate and marginality index and migrant proportion.

and marginality. This study should therefore be seen as *a first step toward trend studies*. The knowledge of migration trends and their potential impacts on the hosting society is crucial especially in the development of anti-poverty plans. Information on the patterns and amount of population redistribution is vital in the planning for progress, Ng (1975) says. Development of databases, though not especially exhaustive but are relevant at the level of municipality, should challenge future researchers. Monitoring tools like the CBMS should be encouraged in the future. Today several Local Government Units (LGUs), NGOs and Regional Development Councils (RDCs) use CBMS. CBMS is being advocated and implemented for capacity building of local government units on poverty diagnosis and planning, and adopted as a tool for localizing the MDGs and for generating local poverty statistics (Reyes *et al.*, 2007).
The methodology we performed may be seen as a successful alternative to this lack of data.

8.5.8 Geostatistical analysis: a key tool

The geostatistical analysis tools we used, like LISA and FCA, were very helpful to identify local peculiarities or local factors and go beyond (obvious) general tendencies. In a sense, the joint use of these exploratory tools has been a support to the identification of spatial structures and/or mechanisms, and the improvement of geographical theories.

8.6 Research perspectives

Based on the discussion in the previous sections, some recommendations and perspectives for future works can be formulated here.

8.6.1 Use of Canonical Correspondence Analysis

In order to identify possible factors of marginality, we used factorial correspondence analysis (FCA) in particular to highlight local peculiarities and what distinguished a village or a group of villages from the average trend – i.e. the trend observed at the provincial level. In this aim, we produced graphs representing variables and villages in the same factorial plane (F1-F2). FCA has highlighted three discriminating dimensions at household level: materiality, traditionality and market opening (see section 7.2). However, we did not obtain conclusive results using variables for individuals, municipalities or environmental variables. Moreover FCA does not allow us to project more than one type of variables on the factorial plane (F1-F2). For instance, while it is possible to project (i) the village-profiles and (ii) the variables about households in a same graph (preferentially an *asymmetric graph*[125]), it is not possible to project (i) the

[125] See footnote 108.

village-profiles, (ii) the variables about households and (iii) the variables about land cover[126].

A method increasingly used, notably in ecology – but also in other disciplines like behavioural sciences or medical sciences (de Leeuw and Mair, 2008) – appears to be adequate for the simultaneous study of sites and data with different dimensions. As the name suggests, this method is derived from correspondence analysis, but has been modified to allow environmental data to be incorporated into the analysis (ter Braak, 1986). Initially, Canonical Correspondence Analysis (CCA) has been developed to allow ecologists to relate the abundance of species to environmental variables (often gradient variables like temperature, organic matter, salinity, etc.) (see Legendre and Legendre (1998) for a formal description of CCA).
This technique has been adapted to many fields and data formats (Lebreton *et al.*, 1988a; Lebreton *et al.*, 1988b; Best (1993) in management; Frederiksen and Lawesson (1992) in remote sensing), and nothing prevents to consider using this technique for the study of marginality factors. Moreover Morales *et al.* (2003) uses CCA in a field very similar to ours: a multivariate analysis of the primary sector in Mexico, using environmental and socio-economic data. CCA has the advantage of allowing the simultaneous analysis of more than two different types of variables (e.g. socio-economic and environmental), which FCA does not allow (Fig. 8.7).

In order to use CCA, one needs (i) a contingency table X that contains the frequencies of a series of objects (for instance species in ecology, in our case objects could be the marginality indices or any other socio-economical variables whatever their dimensions), on the several sites where they are counted and (ii) a table Y of descriptive variables that are measured on the same sites. A correspondence analysis is computed on table X, table Y is processed by a principal component analysis while finally a multiple regression seeks to better explain the factors of correspondence analysis with those of the principal component analysis. A possible CCA's graphical output is the overlapping of objects and variables from X and Y.

CCA, as all ordination method, seeks to find axes maximizing the variances of groups. The technique leads to an ordering diagram where response variables and sites are represented by points and environmental variables by solid lines. The positions of the economic variables and states depend on their point on the ordination axes. Points that are close together in the ordering diagram have a similar average (Morales *et al.*, 2003).

[126] Indeed, the sum on lines in a contingency table must be meaningful as well as the sum on columns. In other words the variables must have the same unit of measurement (see annex 13).

In our case, it is conceivable to generate a graph with 3 kinds of points: (i) villages, (ii) socio-economic indicators / marginality indices and (iii) environmental indicators.

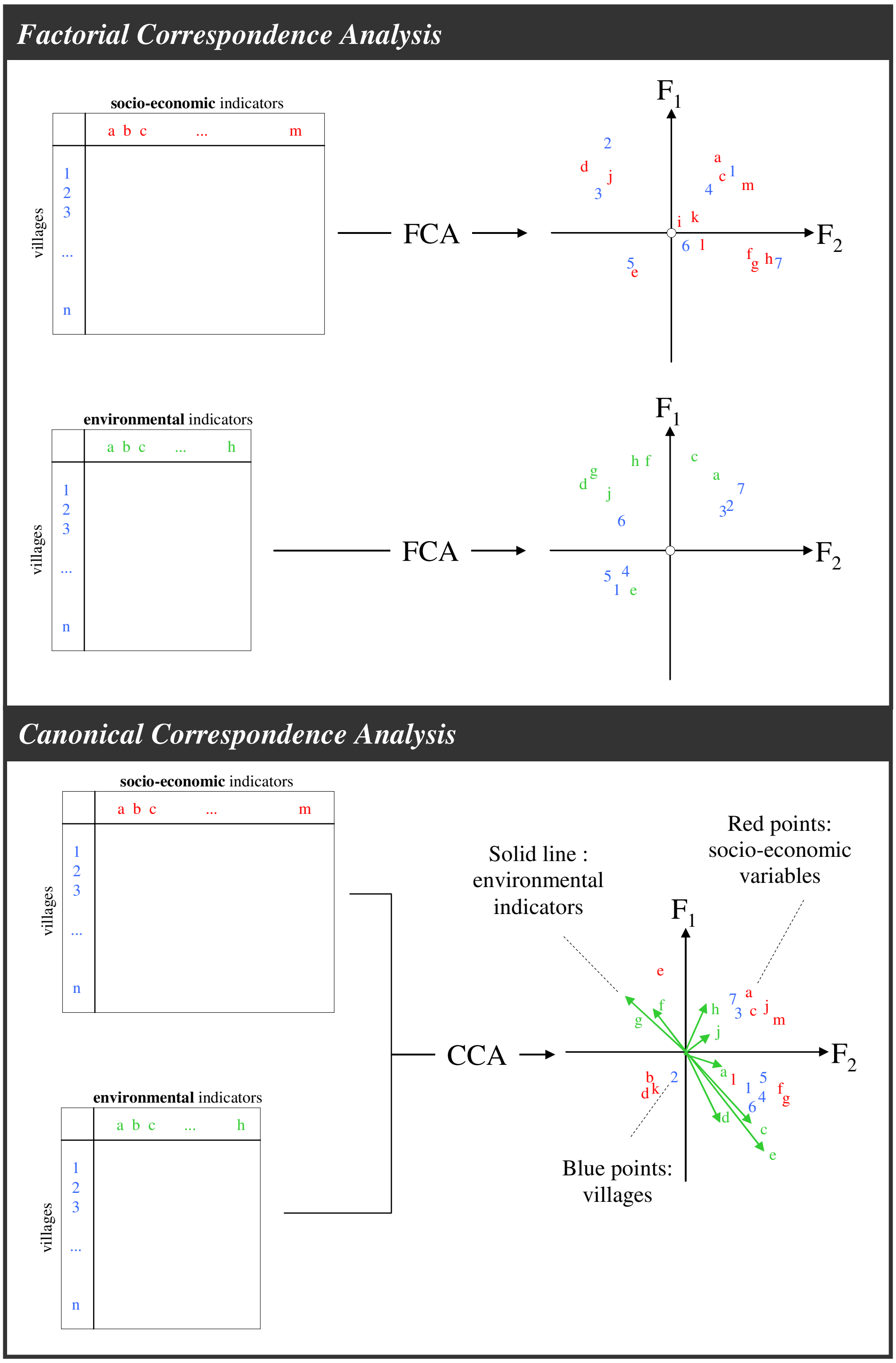

Fig. 8.7 – FCA and CCA: two different types of outputs

8.6.2 Clustering analysis to identify different mechanisms of marginality

Local indicator as Moran's I – used in our study – identify clusters (high-high and low-low spots) but the clustering is only based on marginality values (from the marginality value of each point and the marginality value of the corresponding surrounding points). However two villages can have identical marginality values while their socio-economical profiles are different.

Clustering methods (like Ascendant Hierarchical Classification, AHC) would allow identifying clusters of villages with the same profiles. This could be a complementary way to highlight a possible local mechanism of marginality and/or local influences of migration (Fig. 8.8).

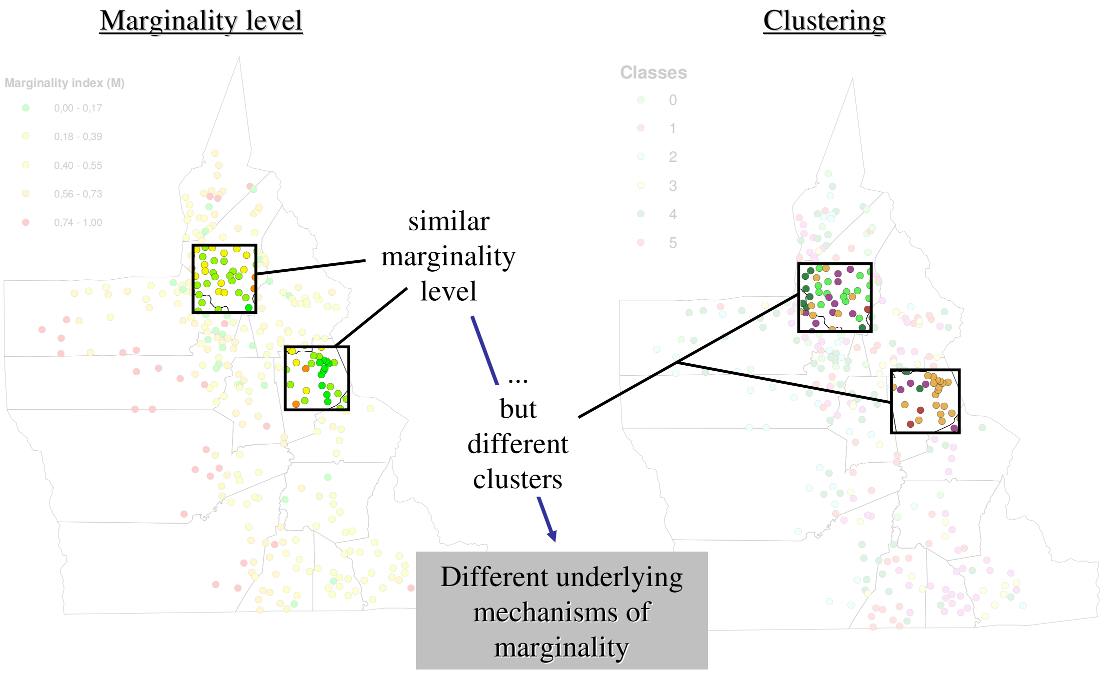

Fig. 8.8 – Clustering as a way to highlight local mechanisms of marginality

8.6.3 Singular vs. dominant… a way to qualitative analysis

Quantitative and qualitative approaches in geography are not mutually exclusive (Philip, 1997). Lawson writes that the "... emphasis on the *difference* between quantitative and qualitative methods among geographers has obscured considerable overlap in the actual operations involved in both sets of techniques" (Lawson, 1995, p.451). They form a *methodological continuum* in terms of their contribution to scientific explanation (Pavlovskaya, 2005).

The identification of the general structures and mechanisms with Agusan del Sur Province has been rather easy. PCA and regression models have shown early the main structural driving forces. However, it is often helpful to identify the singularities. Several exploratory methods such as FCA or LISA helped us to highlight singular villages: for example, a village with low marginality when its neighbours have a high marginality. Behind these specific configurations some unexpected explanatory factors are hiding. In order to get this missing information, a qualitative analysis focused on these singularities would be highly instructive.

8.7 Recommendations

8.7.1 Filling the gaps of CBMS and longitudinal studies

There is a need to restructure large scale demographic and employment surveys so that they can capture population dynamics (Deshingkar, 2006). The CBMS program seems gradually spread throughout the Philippines and continuous regular records – every 5 or 10 years – should allow the development of longitudinal studies necessary in the understanding of the internal migration dynamics. However multicolinearity has been observed in CBMS database during our investigation: for instance the proportion of households with television is strongly correlated to the proportion of households with aircon. A research perspective would be – as a complement to CBMS databases – to conduct nationwide surveys about migration. Indeed, the assessment of migration status through the proxy *non-IPs* lacks nuances and the integration of questions about, for example, the date of arrival, the motivations or if the respondent is a first or a second-generation migrant, etc. would be, according to us, more useful.

8.7.2 Understand the local, the community way, for better integrated policies

There needs to be a greater recognition of the contribution of migration to poverty reduction in national poverty reduction strategies and plans (Deshingkar, 2006).

> "Attempting to control or reverse migration, as many rural development and poverty reduction programmes do, would in fact choke off a major livelihood opportunity that has become available to those living in marginal areas. The existing negative policy and institutional context in many developing countries imposes unnecessarily high costs and risks on migrants".
>
> Deshingkar (2006, p.56).

As observed by several authors in recent years (Engberg-Pedersen and Webster, 2002; Jones, 2008), the *importance of the local context* in the implementation of sustainable policies and comprehensive plans is, by this study, highlighted. This is especially true as more and more participatory approach is required in territory management and development. As we see in the present study an overview of poverty and migration at a finer spatial scale is necessary because only an accurate image (local mapping) within a territory (province) allows for problems identification intrinsic to this area, far over the issues existing at a smaller spatial scale. This allows developing appropriate local policies.

In light of this, political decentralization seems to be effective *only with* the development of accurate local spatial data, in particular about migration[127]. In the Philippines, decentralization policy actually exists. At the lowest political level, the Local Government Units (LGUs)[128] ensure the implementation of – national and local – policies but seem to suffer from a lack of means to obtain an accurate inventory within the administered territory. Several features recently implemented seem however to fill these gaps (CBMS, barangay delineation program, etc.). For instance, CBMS would constitute a tool to provide accurate social pictures for all administrative structures [129] (Fig. 8.9).

Gaventa (2006) in his paper entitled *Finding the Spaces for Change: A Power Analysis* suggests that power spaces exist at all levels *from local to global*. The challenge would be that all stakeholders find its best power spaces, its *space for a real participation*. Therefore, we recommend to enrich our research with data acquired by a participation that will empower people. By integrating their views and expectation into the policies at the local scale, the researcher will increase his chances of filling the gap of the missing/hidden data (see 7.4.2). The researcher will also be able to appreciate the impact of in-migration in such a way that will allow the LGUs to better meet the needs of the people and allievate poverty. Such an approach requires that researchers observe the basic ethics and to pay respect to the community who own the data as they provided these data (Rambaldi *et al.*, 2006). It also raises the question of data updating (McCall and Minang, 2005).

[127] Indeed, according to Bolos and Apin (1979) the least developed area of research into Philippine migration concerns policy and *a closer look at the efforts of the government to solve problem created by internal migration is needed* (Bolos and Apin, 1979, p.33).

[128] There are four types of Local Government Units (LGUs) in the Philippines: Province, City, Municipality and Barangay. Except ARMM regions do not have political power, but merely serve as administrative groupings of provinces.

[129] The meticulous work of ESSC makes sense here. Its detailed inventories and mapping of statistics (in particular CBMS) constitute strong tools for planning.

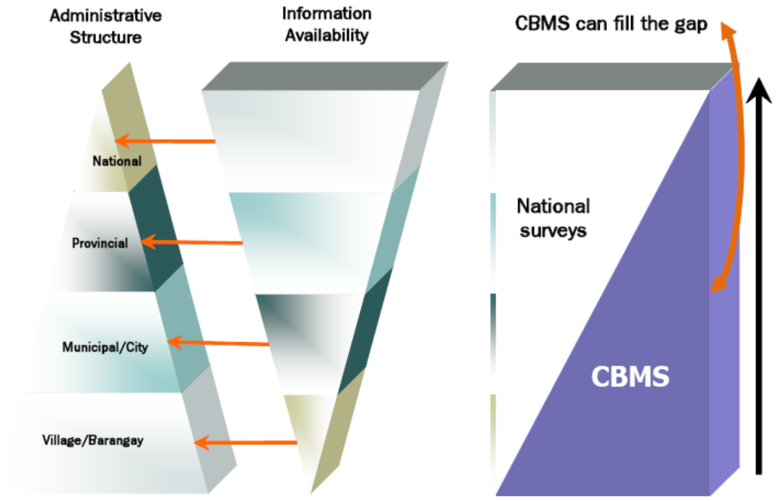

Fig. 8.9 – Administrative structure, information availability and CBMS (source: Reyes et al., 2007).

8.8 Final conclusion

This study contributes to a better understanding of the links between in-migration and marginality in a rural context. Some elements remain unclear but the study has opened many doors for future theoretical or empirical researches. A better understanding of the phenomena studied is a first step that allows envisaging new opportunities in local development and poverty reduction policies. Indeed one can believe that policy makers, planners and/or other local action groups like NGOs would integrate the empirical findings about the provincial structures and migration/marginality mechanisms in the implementation processes of future policies and/or management programs, especially if the participatory approach is reinforced.

More broadly, this study allows the clarification of the interrelationships between migration and marginality including the identification of multiple explanatory factors. A transdisciplinary approach, initiated here by including the analysis of demographic as well as environmental factors, is undoubtedly the way forward in understanding these complex realities.

Through a geographical approach several geographical notions and concepts have been consolidated. The integration of the rural world has led to a significant enrichment of the *migration* and *marginality* concepts. The concepts of spatial isolation (remoteness) or neighbourhood proved to be fundamental in proposing a distinction between endogenous and exogenous marginality. The quantitative approach – predominantly adopted in this study – using both geostatistics and geomatic tools brings out the importance of developing complementary qualitative approaches. The methodology we experienced suggests a useful alternative to the difficult problem of poor data in migration research context.

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Annexes

Annex 1 – Human Development Index (HDI) methodology

The following description of HDI methodology is an excerpt form Noorbakhsh (1998).

> The HDI is a composite index of four indicators. Its components are to reflect three major dimensions of human development: longevity, knowledge and access to resources. These are to represent three of the essential choices `for people to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living' (HDR, 1990).
>
> These dimensions are derived from the notion of human capabilities as proposed by Amartya Sen and are regarded to be the essential requirements for enhancing human capabilities (Desai, 1993). As such 'the process of economic [human] development can be seen as a process of expanding the capabilities of people' (Sen, 1984, p. 497). While it may be argued that there are other dimensions which could equally be regarded as essential, such as law and order, peace, security and freedom, it has been suggested that the components of the HDI together seem to provide an almost acceptable package of indicators of the level of living at an aggregate level (Dasgupta and Weale, 1992).
>
> The dimension of longevity is directly measured by life expectancy at birth. Knowledge is presented by a measure of educational achievement based on a weighted sum of adult literacy rate (2/3) and the combined first, second and third level gross enrolment ratio (1/3).
>
> Since 1994 the HDI for country i was computed from the following formula:
>
> $$\mathrm{HDI}_i = \frac{1}{3}\sum_{j=1}^{3}\left(\frac{X_{ij} - \min F_j}{\max F_j - \min F_j}\right)$$
>
> where X_{ij} is the actual value of component j for country i and min F_j and max F_j are the minimum and maximum values, fixed subjectively, for four constituent indicators.

Annex 2 – What a difference a mill makes (Philstar, June 21, 2009)

For people passing through the village of Remedios in Esperanza, a remote town in Agusan del Sur in Mindanao, the new rice and corn mill at the center of the community looks just like any other structure. But for the 247 families living in this village, the mill is a life-changing project, a fulfilment of their dreams. It is easy to see why. Separated from the town proper by the flood-prone Agusan River and bad roads, residents of this poor farming village are dependent on the production of corn, rice and wood products for their sustenance and livelihood. Until a year ago, getting corn and palay properly milled was a very expensive and difficult effort, a burden which usually fell on the shoulders of women. Residents had to take a habal-habal (motorcycle used as a mountain taxi), paying the driver P20 for every sack of grain brought to the riverbank in Hawilian. From there, they paid another P40 for every sack ferried by boatmen across the river, and then another P15 per sack to drive it to the mill in Esperanza by tricycle. Farmers also paid the habal-habal driver a fare of P15 and another P25 for the boat ride across the Agusan River. At the mill, the farmers paid P2.20 per kilo of corn milled and P1.80 per kilo of palay. That is equivalent to P110 for every 50-kilo sack of corn and P90 for a 50-kilo sack of palay. By the time they got back to Remedios at dusk, each farmer had already spent P350-370 for every sack of grain milled – a huge sum equal to the minimum wage of a daily worker in the city – that they could have used for other needs, like food, clothing and other basic necessities. Because of the prohibitive costs of transport and milling, many people preferred to process their own grain, using the old manually-operated mills fashioned out of heavy stone for corn, and a mortar and pestle for palay. Since the men go to the field early in the morning each day, these heavy tasks fell on the women, besides caring for the children and doing household chores. Manual milling is a labor-intensive and energy-sapping process that takes long hours. Since the community-owned rice mill was built, however, such problems have become a thing of the past, says Cesar Ambray, the barangay captain of Remedios who assists in the management of the mill. A participatory situation analysis was conducted before the construction of the rice mill wherein community members of Remedios identified their problems. They eventually prioritized the need for the rice mill after which a core group of community volunteers prepared a project proposal with technical assistance from the DSWD community facilitator. The community representatives presented their proposal during the Municipal Inter-Barangay Forum (MIBF) which was participated in by all barangays. Fortunately, the rice mill proposal was among those prioritized by the MIBF for KALAHI-CIDSS funding. The rice and corn mill cost P1.78 million to build. The Kalahi-CIDSS program implemented by the Department of Social Welfare and Development (DSWD) and supported by the World Bank provided a grant of P1.25 million, with the local government and the community making their own counterpart contributions in cash and in kind. To ensure transparent and effective management, the community of Remedios established a cooperative and a management team that regularly updates residents on the operational and financial performance of the mill. Ambray says that the rice and corn mill has had a direct impact on the alleviation of poverty in the village. The community mill offers lower charges than the mill in town and, without having to bring the grain over long distances across the river and on dirt roads, farmers are able to save about 70 percent of what they used to spend to mill their grain. Early projections suggested that it would take some time before the mill could break even. But a few months after it was established, the cooperative began to earn. This is because, according to Captain Ambray, farmers from three other barangays nearby began to bring their grain to Remedios for processing, thus extending the benefits of the mill to about 600 more households.

www.philstar.com (June 21, 2009)

Annex 3 – 1960-1970 inter-regional migrants by region of origin and region of destination

Region of destination		Region of origin I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	All in-migrants
I	Ilocos		10,228	17,401	5,449	1,459	685	786	1,123	588	523	1,530	15,299	55,071
II	Cagayan Valley	29,635		34,232	4,812	1,820	876	609	835	82	202	436	8,996	82,535
III	Central Luzon	22,144	10,898		48,458	16,809	10,340	6,839	18,932	1,276	2,204	3,170	67,801	208,871
IV	Southern Tagalog	51,837	21,936	151,518		125,981	77,049	40,628	89,160	8,523	10,791	12,087	276,397	865,907
V	Bicol	1,948	784	5,600	29,425		3,798	10,079	5,953	402	1,295	1,892	36,951	98,127
VI	Wetsern Visayas	642	674	1,890	7,546	3,040		22,230	1,671	2,161	2,619	8,422	22,377	73,272
VII	Central Visayas	408	382	1,646	5,660	3,212	22,774		15,445	10,088	17,593	15,585	14,045	106,838
VIII	Eastern Visayas	798	228	1,368	4,837	2,831	1,739	17,700		1,136	4,735	4,719	22,816	62,907
IX	Western Mindanao	838	342	3,003	2,684	944	17,722	33,799	7,735		44,872	8,909	3,906	124,754
X	Northern Mindanao	3,312	2,425	3,794	6,195	3,324	28,452	119,567	33,229	27,745		37,537	11,040	276,620
XI	Southern Mindanao	10,008	2,384	20,877	8,468	3,764	101,161	110,884	40,837	19,362	40,336		13,378	371,459
XII	City of Manila	21,226	9,301	55,292	62,219	25,830	23,716	14,190	34,746	1,909	2,868	4,104		255,401
	All out-migrants	142,796	59,582	296,621	185,753	189,014	288,312	377,311	249,666	73,272	128,038	98,391	493,006	2,581,762

Annex 4 – Estimated number of immigrants by municipality

Municipality (*)	Observed population		Extrapolated population	Estimation of the number of migrants (eq. 4.4)		Estimation of the number of immigrants (eq. 4.2)
	P^{obs}_{1970}	P^{obs}_{2007}	P^{ext}_{2007}	Immigrants	Emigrants	Immigrants
Bayugan	37,816	95,032	103,182		8,150	18,766
Bunawan	8,656	35,757	23,618	12,139		4,755
Esperanza	21,051	47,659	57,438		9,779	44,659
La Paz	7,971	25,214	21,749	3,465		8,023
Loreto	13,057	34,549	35,626		1,077	10,888
Prosperidad	23,328	75,390	63,651	11,739		22,311
Rosario	7,885	31,293	21,514	9,779		19,324
San Francisco	17,636	62,881	48,120	14,761		13,224
San Luis	7,531	30,424	20,549	9,875		14,018
Santa Josefa	3,601	24,972	9,825	15,147		18,567
Talacogon	7,719	46,247	21,061	25,186		20,653
Trento	11,815	36,862	32,238	4,624		43,963
Veruela	6,626	33,093	18,079	15,014		68,043
AGUSAN DEL SUR	174,692	579,373	476,651	121,728	19,006	307,194

(*) Municipality of Sibagat is not account here because no figure about population before 1990 was available.

Annex 5 – Sites Selection / Synthetic table after the first field survey (January 2006)

Variables	Marfil	Bayugan III	Aurora	San Andres	Maligaya	Caimpugan
Access to market						
Distance to highway (km)	17	0	5	0	7	10
Distance to market (km)	Rosario (17)	Along the highway	Sta-Josefa (3)	Bunawan (5)	Rosario (7)	San Fransisco (25)
	Surigao (40)	San Fransisco				Rosario (15)
Existence of middle-man	✓	✓	✓	✓	✓	✓
Population						
# habitants / # households	2000/673	6000/1069	3300/1000	300/100	700/280	1747 hab.
Structure (%IP / %Migrants)	20/80	60/40	20/80	50/50	75/25	15/85
Homogeneous - Heterogeneous	Homogeneous	Heterogeneous	Heterogeneous	Heterogeneous	Homogeneous	Homogeneous
Conflicts	Land	Land	Land (-)	Encroachment	Land	No
		Peace and Order				
Facilities						
School (level)	I - II	I - II - High	I	I	I	I
Health Center	✓	✓	✓	✓	✓	✓
Day Care	✓	✓	✓	✓	✓	✓
Water System (level)	II	II	II	II	III (not fonct.) / II	I
Land Use						
Tree	Falcata	Falcata	Palm, Banana	Falacta (70 %)	Palm Oil	
Rattan	✓	✓		✓		
Rice		in low	✓	in low		✓
Crops		Corn	Corn	Roots / Corn		Corn
Vegetables	→ market	→ direct buyer	→ market			✓
Gold Panning/Mining/Tunnel		✓			✓	
Others						
Self-Consumption	✓	✓	20%	✓	✓	✓
Cooperative		Falcata	Rice and Corn	Forest pr. (TUFA)	✓	Coop. of farmers
Existing Plans	CADC	CADC / CBRM	CLOA	CBFM	CADC / CLOA	
Alternatives	Farm labor	Farm labor	Mini-store		Amakan weaving	

Annex 6 – Questionnaires

QUESTIONNAIRE - PARTICULAR

Barangay Name: ____________________
Date: ______________
Purok n° _________
Interviewer: ________
Your name: _______________________________

Gender: ☐ Male ☐ Female

Age: ☐ 0-15 years old ☐ 31-45 years old ☐ More than 60 y. old
☐ 16-30 years old ☐ 46-60 years old

Place of born: ____________

Composition of your household

Are you head of household? ☐ yes ☐ no

What is the size of your household (you included)?

☐ 1 ☐ 4 ☐ 7
☐ 2 ☐ 5 ☐ more:_____
☐ 3 ☐ 6

How many children? _________

How many children under 15 years old? __________

Location

Could you locate, on the picture, your house and the place where you and the members of your household work?

Living Sources - Activities

What are your main activities? *Fill by a "S" if seasonal. Please complete questions (a), (b), (c), (d) and/or (e) according your answer.*

☐ Farming [see (a)]
☐ Forest products [see (b)]
☐ Fishing [see (c)]
☐ Mining [see (d)]
☐ Trading [see (e)]
☐ Other [see (f)]

(a) Farming/Livestock

a.1. Which products do you grow? Specify the part of self-consumption. If seasonal, please specify it.

CROP	Number of ha. or Nb of parcels	Part of self-consumption (% or ha)	Seasonal
☐ rice			
☐ cassava/root			
☐ maize/corn			
☐ vegetables			
☐ sweet potatoes			
☐ fruits			
☐ other:			
LIVESTOCK	Number of head	Part of self-consumption (%)	
☐ chicken			
☐ pig/hog			
☐ carabao			
☐ other:			

a.2. Are you:

☐ self-employed [see a.2.a.]
☐ in a cooperative [see a.2.b.]
☐ engaged by a firm [see a.2.c.]

a.2.a. If you are self-employed:
where do you sell the production?
how do you transport the production to the market?
frequency:

a.2.b. If you are in a cooperative, could you tell me:
where are sold the production?
how are transported the production to the market?
frequency:

a.2.c. If you are engaged by a firm, do you received a salary or are you paid according the production?

a.3. You are:

☐ landowner of your parcels
☐ tenant
☐ neither landowner nor tenant. *Specify:* ____________

a.4. On how many parcels do you work?__________

a.5. Do you work on spatially separated parcels?

☐ no ☐ yes

*Maximum Distance between two of your parcels:*__________

a.6. What is the total size of the parcels that you exploit? _________ ha

a.7. Where are located the parcels? see map

a.8. How do you go to the parcels?
Specify the transportation mean: _______________

a.9. Do you have the use of some labour tools? *Fill by an "o" if you are owner or by a "v" if the tool is collective one.*

- ☐ carabao
- ☐ tractor
- ☐ transportation (specify: ____________)
- ☐ barn
- ☐ other: ___________

a.10. a. Do you meet some problems in your work?
b. What would be a solution?

a.11. Since you work in this village, do you have noted significant changes or did you have to change of work place? (way to work, place to work, conflicts, etc.) *If yes* Could you explain briefly? *When? Reasons?*
____
____
____

(b) <u>Forestry</u>

b.1. Which products do you exploit? *If seasonal, please specify it.*

Wood ☐ falcata ☐ molave

Non-wood ☐ bamboo ☐ rattan

Fruit ☐ palm oil ☐ coconut ☐ banana

Other: ____________________

b.2. Are you:

☐ self-employed [see b.2.a.]
☐ in a cooperative [see b.2.b.]
☐ engaged by a firm [see b.2.c.]

b.2.a. If you are self-employed:
where do you sell the production?
how do you transport the production to the market?
frequency:

b.2.b. If you are in a cooperative, could you tell me:
where are sold the production?
how are transported the production to the market?
frequency:

b.2.c. If you are engaged by a firm, do you received a salary or are you paid according the production?

b.3. Where are you working in forest? see map *If seasonal places, please specify them.*

b.4. How do you go to the working place?
Specify the transportation mean: ________________

b.5. Since you work in this village, did you have to change of work place?
☐ no ☐ yes
If yes Where? ________________________
Why? ____________________________

b.6. Since you work, do you have noted significant changes or did you have to move to work?
(way to work, place to work, conflicts, etc.)
If yes Could you explain briefly? *When? Reasons?*

____
____
____

(c) Fishing

c.1. Are you:

☐ self-employed [see c.1.a.]
☐ in a cooperative [see c.1.b.]
☐ engaged by a firm [see c.1.c.]

c.1.a. If you are self-employed:
where do you sell the fish production?
what is the part of self-consumption?
how do you transport the production to the market?
frequency:

c.1.b. If you are in a cooperative, could you tell me:
where are sold the production?
how are transported the production to the market?
frequency:

c.1.c. If you are engaged by a firm, do you received a salary or are you paid according the production?

c.2. Are you:

☐ in a cooperative
☐ engaged by a firm
☐ self-employed

c.3. Since you work, do you have noted significant changes or did you have to move to work? (way to work, place to find fish, conflicts, etc.) *If yes* Could you explain briefly? *When? Reasons?*

____
____
____
____

(d) Mining

d.1. Do you sell mining production:

☐ to middle-men
☐ directly to market
*In this case, where?*___________
transportation:
how are the products sent to the market?
☐ I am engaged by a firm which deal with sales
☐ I am engaged in a cooperative which deal with sales

d.2. Are you:

- ☐ in a cooperative
- ☐ engaged by a firm
- ☐ self-employed

d.3. Since you work, do you have noted significant changes or did you have to move to work? (way to work, place to find nuggets, conflicts, etc.) *If yes* Could you explain briefly? *When? Reasons?*

____

____

(e) Trading

e.1. Which products do you sell?

e.2. Where do you sell them?

- ☐ in the village
  - if possible located the sell point on map
  - how are the products transported to the sell point?
  - at which frequency? (ex.: 2 a week)
- ☐ in a town
  - where?___________
  - how are the products transported to the sell point?
  - at which frequency? (ex.: 2 a week)

d.3. Since you work, do you have noted significant changes or did you have to move to work? (way to work, place to find nuggets, conflicts, etc.) *If yes* Could you explain briefly? *When? Reasons?*

____

____

____

(f) Other

f.1. What is your job? ______________

f.2. What transportation mean do you use to go work?_______________

f.3. Since you work, do you have noted significant changes or did you have to move to work? (way to work, place to find nuggets, conflicts, etc.) *If yes* Could you explain briefly? *When? Reasons?*

____

____

____

Migration

For how many years are you in this barangay? _____________
Did you born in this barangay?

☐ no ☐ yes

If no, please fill box A
If yes, please fill box B

Are you an IP?

☐ no ☐ yes

BOX A – Not born in the barangay

From where do you come?

Island: _______________
Province:____________

Barangay: ______________
Ethnic origin: ________________
For how many years are you in this barangay? ___________________
What were the reasons of your arrival?

☐ Relative(s) in this village
☐ Wedding
☐ Find a new job
☐ Better salary
☐ Acquired property
☐ Start living independently
☐ Schooling
☐ Push factors at the origin.

Which? ☐ poor job ☐ escape violence
☐ no job ☐ drought/famine/disease

☐ Another reason: _________________________

Do you have the same activity than in your origin place?

☐ yes ☐ no *If no, what was your activity?*

In this village, do you have changed of activity, place of work or house since your arrival? *If yes* When? Why?

Do you have contact with your former place? What kind of contacts?

BOX B – Born in the barangay

Are you an IP? ☐ no ☐ yes
Are some members of your household left the barangay?
☐ no ☐ yes *Who?* ☐ Son ☐ Daughter ☐ Other:_______________ *If yes: For which reasons, has she/he/they left?*
____
____
To where?
☐ Urban outside Mindanao (____________________) ☐ Urban on Mindanao (____________________) ☐ Rural (____________________)

Do you have changed of activity, place of work or house since you live here?
If yes When? Why?

Mobility

What is your main destination outside the village? ________________
What are the main reasons to go there? ________________
Frequency (ex. 3/week) : ______________
Travel Time (minute): ________________
Distance (km): _______________
Travel Cost (pesos): ________________
What transportation mean(s) do you use?
☐ Car
☐ Tractor
☐ Motorcycle
☐ Bicycle
☐ Boat
☐ Public transportation
How should you qualify the road quality? ☐ Good
☐ Good in one season
(which months: -)
☐ Bad in all seasons

Drinking Water

What is the main source of drinking water?
- ☐ well
- ☐ pond
- ☐ rain
- ☐ river
- ☐ water box (type: ______)

Do you have access to drinking water:
- ☐ all the year
- ☐ only during ________ months

How many time do you take (by walking) to the nearest water source? _________ minutes
How many wells are there in the village? ______

Education

Where do your children go to school? *Specify where if outside of the village.*
- ☐ elementary school
- ☐ high school

How do they reach school?
- ☐ walking
- ☐ bicycle
- ☐ motorcycle
- ☐ public transportation
- ☐ car
- ☐ other: ___________

Market

If usually you sell products on market:
Which town/market? ______________
Transportation mean used to reach the market to sell products: _____________
Travel time to reach the market to sell products: ____ minutes

When you buy products on market:
Which town/market? ______________
Transportation mean used to reach the market to buy products: _____________
Travel time to reach the market to buy products: ____ minutes

Priorities

- If you could change something, in the village or in your life, what would you change?

- Among the following concerns, could you choose the five which are the most important according you and prioritize them (1 to 5 where "1" is the most important concern)?

Concerns	Choose 5 and prioritize them
a. Unemployment	
b. Lack of drinking water	
c. Lack of farm to market road	
d. Unskilled labor force	
e. Lack of pre and post harvest facilities	
f. Lack of school facilities and teachers	
g. Endemic filariasis and schistosomiasis	
h. Electro-fishing/Illegal fishing	
g. Illegal logging	
i. Improper waste disposal	
j. Low educational attainment	
k. Presence of squatter	
l. Other *Specify:* ________________________	
m. Other *Specify:* ________________________	

- About the five concerns you have selected above, what would be possible solutions according you?

Thank you very much for your time.

QUESTIONNAIRE TO BARANGAY CAPTAIN

Instructions for questionnaire completion: Please indicate with an '**x**' in the box that **best corresponds** to your answer. Where indicated, please **prioritize** your answer using the **numbers 1 – 5 (1 = most relevant/ 5 = least relevant)** in the corresponding box. If possible, please **elaborate your answer** where space is made available.

1) To what **extent is poverty a concern** in your barangay?
☐ Very much
☐ To some extent
☐ Not very much

2) What is the **main cause** of poverty in your barangay?
☐ Bad access conditions
☐ Lack of land
☐ Other: ________________

IN-migrants

2) How many people are arrived in the barangay for the last 10 years?
3) From where they come?
4) What were the reasons of their arrival?
☐ Relative(s) in this village
    ☐ Wedding
    ☐ Find a new job
    ☐ Better salary
    ☐ Acquired property
    ☐ Start living independently
    ☐ Schooling
    ☐ Push factors at the origin.
        Which? ☐ poor job ☐ escape violence
        ☐ no job ☐ drought/famine/ disease
    ☐ Another reason: _____________

OUT-migrants

5) How many people have leaved the barangay for the last 5 years?
6) To where they leaved?

Destination	Estimated number of people
☐ Urban outside Mindanao	_______ people
☐ Urban on Mindanao	_______ people
☐ Rural	_______ people

7) What were the reasons of their leaving?

☐ Marriage
☐ Find a new job
☐ Better salary
☐ Acquired property
☐ Start living independently
☐ Schooling
☐ Push factors at the origin.

Which? ☐ poor job ☐ escape violence
☐ no job ☐ drought/famine/disease

Priorities

8) Which of the below issues are your barangay members **mostly concerned** about in their everyday life?
(*please **prioritize** your answer using the numbers 1 – 5*)
Do you observe difference between ▪ IP and migrants?
▪ men and women?
If yes, please fill grey columns.

	Barangay	IP	Migrants	Men	Women
Livelihoods	☐	☐	☐	☐	☐
Food	☐	☐	☐	☐	☐
Health	☐	☐	☐	☐	☐
Income	☐	☐	☐	☐	☐
Others *Please specify*	☐	☐	☐	☐	☐

9) According you, which **groups** within your barangay are **mostly affected** by poverty?

☐ IP's
☐ Migrants
☐ Farmers
☐ Loggers
☐ Fishers
☐ Youth
☐ Women
☐ Other *Specify:* __________

10) What are the **most important factors** in achieving **poverty alleviation?**

.

.

.

General information about barangay

11) Are all villagers have the same access to each facility?

12) Are all villagers equal to find a house? to find a job? to obtain a field?
Who have to most difficulties? Why?

13) Do you have noted any changes since first migrants are arrived in the village? What kind of changes?

14) Did any villagers have to move (place to work or place of their household) for some years? When? Why?

15) Have you noted any conflicts in the village (conflicts about the land or something else)?

16) If you could change something, in your village, what would you change?

Thank you very much for your time.

Annex 7 – Places of birth by region for the four surveyed barangays

	Bayugan III (n=13)	Caimpugan (n=34)	Maligaya (n=25)	Marfil (n=4)
Western Visayas	1	1		
Central Visayas	3	6	8	2
Eastern Visayas		5	1	1
Zamboanga Peninsula	2			
Northern Minanao	2		3	
Davao Region		10	4	1
SOCCSKARGEN	1	5	1	
Caraga	4	5	6	
ARMM		2	2	

Annex 8 – Millennium Development Goals

The Millennium Development Goals (MDGs) are eight goals to be achieved by 2015 that respond to the world's main development challenges. The MDGs are drawn from the actions and targets contained in the Millennium Declaration that was adopted by 189 nations-and signed by 147 heads of state and governments during the UN Millennium Summit in September 2000.

The eight MDGs break down into 21 quantifiable targets that are measured by 60 indicators.

Goal 1: Eradicate extreme poverty and hunger
Goal 2: Achieve universal primary education
Goal 3: Promote gender equality and empower women
Goal 4: Reduce child mortality
Goal 5: Improve maternal health
Goal 6: Combat HIV/AIDS, malaria and other diseases
Goal 7: Ensure environmental sustainability
Goal 8: Develop a Global Partnership for Development

Annex 9 – CBMS core indicators and descriptive statistics

	Brgy__Name	Municipality	HH	POP	P_CHILDTH	P_WM_DIED	P_MALNOUR	P_MKSHIFT	P_SAFEW	P_TOILET	P_NOTEL	P_1316NOHI	P_POV_TR	P_FOODTR	P_FDSHORT	P_LABUN	P_VICT_CR
1	AFGA	Sibagat	684.00	3514.00	1.17	0.00	0.59	0.15	26.02	40.20	25.47	47.30	72.08	58.04	8.04	10.21	0.06
2	AGSABU	Esperanza	73.00	433.00	0.00	0.00	4.30	4.11	100.00	83.56	23.75	81.13	89.04	78.08	13.70	1.94	0.46
3	ALEGRIA	San Francisco	969.00	4656.00	0.15	0.00	4.80	12.18	12.69	26.42	18.90	37.87	55.31	38.60	6.60	14.97	0.17
4	ANAHAWAN	Sibagat	113.00	594.00	0.00	0.00	1.08	2.65	98.23	33.63	14.49	50.65	92.92	81.42	15.93	13.38	0.17
5	ANGAS	Sta. Josefa	637.00	2964.00	1.03	0.00	0.82	5.81	27.16	5.02	21.75	41.44	61.54	45.84	13.03	4.82	0.71
6	ANGELES	La Paz	131.00	831.00	0.54	5.13	5.41	9.92	99.24	98.47	51.16	96.59	86.26	80.15	46.56	22.08	0.12
7	ANISLAGAN	San Luis	448.00	2121.00	0.25	0.00	17.75	0.00	25.45	61.16	29.00	56.95	64.96	49.55	0.00	4.42	0.00
8	ANITAP	Veruela	118.00	570.00	0.00	0.00	4.67	3.39	97.46	82.20	26.67	57.69	79.66	58.47	72.88	3.54	3.51
9	ANOLINGAN	Esperanza	259.00	1339.00	0.42	0.00	1.69	1.54	14.29	20.08	24.56	52.94	69.50	52.12	36.68	31.56	0.15
10	AURORA P	Prosperidad	492.00	2650.00	0.45	0.00	19.78	1.63	99.19	55.49	40.60	70.77	79.27	65.24	2.85	3.87	2.79
11	AURORA S	Sta. Josefa	449.00	2130.00	0.62	0.00	0.31	31.40	13.81	17.59	18.56	37.37	84.19	75.28	10.47	9.32	0.52
12	AWA	Prosperidad	339.00	1734.00	0.00	0.00	0.00	0.88	38.64	24.78	24.11	53.30	61.65	48.67	12.68	18.20	0.06
13	AWAO	Sta. Josefa	370.00	1755.00	0.74	0.00	0.74	2.70	58.65	32.70	17.79	49.11	75.68	66.49	42.43	3.87	1.08
14	AZPETIA	Prosperidad	330.00	1715.00	0.82	0.00	0.00	7.27	46.06	26.97	16.42	39.39	65.15	52.12	14.55	10.27	0.12
15	BACAY II	Veruela	130.00	639.00	1.65	0.00	5.79	13.08	96.92	86.92	41.13	69.23	72.31	57.69	73.85	4.09	2.35
16	BAKINGKING	Esperanza	75.00	456.00	1.22	0.00	4.88	5.33	100.00	30.67	29.73	70.37	90.67	73.33	38.67	8.33	0.88
17	BALIT	San Luis	112.00	694.00	5.10	0.00	0.00	0.00	55.36	26.79	38.32	63.64	97.32	95.54	0.89	4.12	0.00
18	BALOBO	Esperanza	83.00	481.00	0.00	0.00	0.00	0.00	1.20	75.90	23.53	64.41	80.72	62.65	22.89	27.71	0.21
19	BANAGBANAG	Sibagat	109.00	658.00	0.70	0.00	21.68	0.00	81.65	54.13	24.68	64.62	88.07	78.90	7.34	8.11	0.00
20	BARANGAY I	San Francisco	825.00	4196.00	0.96	0.00	5.29	3.52	9.70	4.00	24.79	32.65	38.79	25.82	10.42	11.78	0.19
21	BARANGAY II	San Francisco	537.00	2732.00	0.59	0.00	4.13	0.19	0.19	2.42	16.19	20.24	17.13	10.61	0.00	14.51	1.21
22	BARANGAY III	San Francisco	503.00	2496.00	1.10	1.59	6.08	4.97	0.20	8.95	25.06	12.74	25.84	12.33	1.39	14.17	0.52
23	BARANGAY IV	San Francisco	491.00	2318.00	0.33	0.00	0.33	3.67	0.00	0.61	20.25	16.05	21.79	9.78	1.43	10.77	0.04
24	BARANGAY V	San Francisco	791.00	3861.00	0.53	0.00	0.00	4.17	0.38	1.26	22.13	17.51	25.79	13.65	0.13	11.31	0.21
25	BASA	Trento	355.00	1765.00	0.00	0.00	2.88	1.41	43.66	41.41	33.72	60.33	76.62	61.13	12.68	8.27	2.89
26	BATAAN	La Paz	223.00	1348.00	1.48	0.00	6.27	0.00	96.41	70.85	29.77	75.50	87.00	74.89	23.77	29.32	0.22
27	BATUCAN	Talacogon	310.00	1558.00	0.84	0.00	2.52	1.29	20.65	29.35	36.58	58.05	77.74	63.23	5.16	9.57	0.06
28	BAYLO	San Luis	205.00	986.00	0.00	0.00	0.00	10.24	22.93	23.90	12.31	50.51	86.83	78.05	0.98	8.45	0.71
29	BAYUGAN II	San Francisco	794.00	3839.00	0.58	0.00	19.54	7.05	11.21	9.82	22.19	24.32	39.04	19.14	5.16	13.40	0.78
30	BAYUGAN III	Rosario	1425.00	6782.00	0.20	0.00	0.10	11.16	17.96	19.23	27.78	47.00	67.72	53.40	4.14	10.33	0.15
31	BENTAHON	Esperanza	178.00	856.00	0.00	0.00	4.92	0.00	35.39	30.90	25.00	59.80	84.27	73.03	14.04	6.59	0.12
32	BERSEBA	Bayugan	421.00	2077.00	0.00	0.00	1.92	3.80	36.10	54.87	39.23	67.70	80.76	67.46	35.63	0.23	1.59
33	BINICALAN	San Luis	604.00	2530.00	0.24	0.00	0.72	0.50	90.56	86.59	70.38	95.00	98.51	96.69	14.07	1.33	0.00
34	BINONGAN	Sta. Josefa	248.00	1243.00	0.88	0.00	4.85	27.42	33.06	27.02	25.68	47.50	72.98	59.68	63.71	4.85	0.24
35	BINUCAYAN	Loreto	399.00	1974.00	1.27	0.00	0.63	0.00	62.16	46.87	22.67	51.24	86.72	78.45	1.50	7.36	0.10
36	BITAN - AGAN	San Francisco	165.00	857.00	0.55	0.00	0.58	0.00	15.76	53.94	31.72	58.70	64.24	47.88	33.94	10.50	23.69
37	BOCAC	Bayugan	538.00	2621.00	0.00	0.00	0.45	5.58	16.17	20.63	23.64	44.37	56.51	36.80	10.22	4.60	1.22
38	BORBON	San Francisco	417.00	1958.00	0.00	0.00	6.63	3.36	11.75	46.52	25.13	50.93	65.71	47.24	6.24	24.31	0.05
39	BUENA GRACIA	Talacogon	241.00	1210.00	0.53	0.00	0.53	0.41	36.93	49.79	32.83	71.32	77.59	63.49	14.52	9.74	0.66
40	BUENA SUERTE	San Francisco	276.00	1267.00	0.93	0.00	4.64	0.72	6.16	28.26	26.07	45.59	41.30	25.72	6.88	8.63	0.00
41	BUNAGUET	Esperanza	148.00	769.00	0.00	0.00	0.00	0.00	4.05	84.46	24.10	54.55	89.19	75.00	0.00	0.00	0.00
42	BUNAWAN BROOK	Bunawan	738.00	3766.00	0.34	0.00	1.37	6.23	28.86	46.75	25.72	59.75	61.38	48.37	13.28	15.55	3.43
43	CABANTAO	Rosario	223.00	1162.00	0.55	0.00	8.24	6.73	24.22	17.49	28.09	46.46	66.82	57.85	22.42	10.92	0.17
44	CABAWAN	Rosario	213.00	1064.00	1.26	0.00	0.00	8.92	0.00	27.70	32.47	62.50	89.67	82.63	32.86	1.89	0.00
45	CAGBAS	Bayugan	345.00	1696.00	0.36	0.00	0.72	3.19	8.70	17.68	30.12	54.09	69.28	57.10	9.28	9.22	4.25
46	CAIGANGAN	Veruela	166.00	811.00	0.00	0.00	0.70	0.00	4.82	81.33	39.87	48.24	78.31	62.05	60.24	8.36	0.00
47	CAIMPUGAN	San Francisco	271.00	1252.00	0.77	0.00	7.48	1.11	73.80	49.08	44.32	76.38	67.90	52.40	1.11	8.17	0.16
48	CALABOAN	Esperanza	61.00	334.00	2.63	0.00	0.00	3.28	93.44	98.36	33.82	90.70	95.08	86.89	88.52	12.50	0.00
49	CALAITAN	Bayugan	393.00	1987.00	0.30	1.69	0.89	4.07	12.72	46.56	33.25	55.60	74.81	59.80	13.99	5.81	1.86
50	CANAYUGAN	Bayugan	208.00	1015.00	0.63	0.00	0.00	4.81	59.62	9.62	23.44	29.27	54.81	38.46	10.58	9.06	2.76
51	CANDIIS	Veruela	138.00	676.00	0.78	0.00	1.55	5.07	93.48	79.71	34.59	57.38	82.61	73.19	71.74	0.34	2.07
52	CATMONON	Esperanza	294.00	1456.00	0.00	0.00	0.00	3.06	0.34	8.16	16.30	40.82	70.07	52.04	6.12	6.87	0.07
53	CEBOLEN	Trento	156.00	792.00	0.76	0.00	15.91	19.87	16.67	16.67	39.84	59.79	47.44	27.56	7.05	3.75	0.00
54	CECELIA	San Luis	171.00	926.00	0.00	0.00	0.00	0.58	62.57	86.55	26.79	54.64	87.13	71.93	0.00	2.24	0.00
55	CHARITO	Bayugan	311.00	1632.00	0.80	0.00	0.00	2.25	32.80	9.65	28.09	45.45	78.14	67.20	16.08	0.63	0.92
56	CLARO CORTEZ	Bayugan	128.00	591.00	2.13	5.56	3.19	3.13	36.72	42.97	26.92	50.70	63.28	48.44	2.34	2.23	0.68
57	COALICION	San Luis	259.00	1314.00	0.00	0.00	0.78	0.00	27.80	50.19	22.26	59.85	88.42	79.15	0.00	6.77	0.00
58	COMOTA	La Paz	223.00	1373.00	0.39	0.00	0.00	16.14	47.98	76.68	16.31	77.07	87.44	73.99	31.39	7.32	2.69
59	CONCEPCION	Sta. Josefa	141.00	706.00	0.97	0.00	9.71	2.13	98.58	67.38	16.55	24.66	87.23	78.72	28.37	20.96	0.99
60	CONCORDIA	Esperanza	153.00	787.00	0.00	0.00	1.47	0.00	0.00	81.70	28.26	65.56	58.82	39.22	0.00	0.40	0.00
61	CROSSING LUNA	Bayugan	256.00	1214.00	0.00	0.00	2.81	0.39	1.95	12.50	19.34	36.18	57.42	41.41	26.56	6.82	0.25
62	CUBO	Esperanza	139.00	695.00	0.00	0.00	4.40	3.60	1.44	26.62	28.57	64.77	65.47	49.64	20.14	20.08	1.15
63	CUEVAS	Trento	392.00	1803.00	0.74	0.00	12.64	13.27	45.92	34.18	25.56	55.96	64.80	46.43	8.67	10.00	2.27
64	CULI	San Luis	168.00	904.00	1.44	0.00	4.81	0.60	55.95	63.69	30.65	75.61	80.95	71.43	33.93	3.33	1.33
65	CULIRAM	Talacogon	101.00	476.00	0.00	0.00	1.30	0.00	35.64	51.49	22.35	67.92	90.10	84.16	0.00	9.94	0.00
66	DACUTAN	Esperanza	548.00	2790.00	0.69	1.37	0.46	6.75	0.18	8.76	20.60	43.40	59.12	42.70	64.42	4.09	1.79
67	DAS - AGAN	Prosperidad	263.00	1264.00	0.47	0.00	8.49	19.01	3.80	59.70	28.81	40.35	50.19	23.57	7.60	4.92	0.08
68	DEL MONTE T	Talacogon	1264.00	6001.00	0.35	0.00	0.35	2.45	51.19	30.46	22.06	39.64	56.17	43.28	2.77	9.16	1.10
69	DEL MONTE V	Veruela	286.00	1388.00	0.93	0.00	0.00	0.70	68.18	57.34	29.37	52.00	67.13	52.80	51.40	3.57	0.14
70	DEL ROSARIO	Sibagat	71.00	351.00	0.00	0.00	8.16	5.63	21.13	38.03	22.06	56.82	85.92	80.28	29.58	4.41	9.69
71	DESAMPARADOS	Talacogon	192.00	1079.00	0.00	0.00	5.50	0.00	81.25	55.21	27.72	69.90	77.08	56.25	20.83	8.78	0.37
72	DIMASALANG	San Luis	196.00	1008.00	0.00	0.00	0.60	0.00	4.59	60.20	22.54	63.06	91.84	87.76	0.00	5.22	0.00
73	DON ALEJANDRO	San Luis	374.00	1941.00	1.43	0.00	0.00	5.61	34.22	44.12	25.30	57.07	76.74	66.58	10.70	9.91	0.21
74	DON MATEO	Veruela	153.00	802.00	3.27	0.00	7.19	5.23	98.04	51.63	22.29	57.14	86.27	69.93	82.35	4.66	1.12
75	DON PEDRO	San Luis	57.00	317.00	0.00	0.00	0.00	10.53	38.60	73.68	21.67	73.33	94.74	84.21	0.00	1.08	0.00
76	DUANGAN	Esperanza	259.00	1331.00	0.88	0.00	7.02	3.86	2.70	18.15	25.74	69.66	71.04	56.76	23.17	2.88	0.00
77	EBRO	San Francisco	273.00	1341.00	0.60	0.00	53.52	1.47	67.77	59.71	28.62	55.07	63.00	38.10	21.25	6.13	1.19
78	EL RIO	Sibagat	246.00	1212.00	1.52	0.00	4.06	5.28	18.29	21.54	25.91	42.97	80.08	73.17	36.59	11.25	4.70
79	FILI	Bayugan	379.00	1947.00	0.00	0.00	0.00	1.85	12.40	11.08	21.84	37.09	53.03	37.47	16.36	5.53	6.57
80	GAMAO	Bayugan	204.00	1005.00	0.61	0.00	0.00	0.49	7.84	19.61	26.29	54.70	71.08	60.29	15.69	1.95	1.00
81	GETSEMANE	Prosperidad	70.00	329.00	0.00	0.00	0.00	0.00	100.00	44.29	23.88	41.03	84.29	61.43	2.86	0.00	0.00
82	GRACE ESTATE	Bayugan	163.00	648.00	0.96	0.00	17.31	0.61	4.29	17.79	17.20	28.89	44.17	29.45	0.00	5.17	0.00
83	GUADALUPE	Esperanza	642.00	3342.00	0.52	1.10	5.93	3.74	11.84	30.84	23.87	52.69	68.22	50.47	24.77	12.34	0.06

	Brgy__Name	Municipality	HH	POP	P_CHILDTH	P_WM_DIED	P_MALNOUR	P_MKSHIFT	P_SAFEW	P_TOILET	P_NOTEL	P_1316NOHI	P_POV_TR	P_FOODTR	P_FDSHORT	P_LABUN	P_VICT_CR
84	GUEBUNON	Esperanza	101.00	537.00	0.00	0.00	3.81	0.00	100.00	94.06	18.18	91.23	99.01	93.07	90.10	21.43	0.00
85	HALAPITAN	La Paz	122.00	609.00	0.00	0.00	0.00	0.00	95.90	82.79	17.09	60.32	85.25	75.41	0.00	31.77	0.00
86	HAMOGAWAY	Bayugan	291.00	1342.00	0.50	0.00	0.00	4.12	25.77	27.84	28.47	44.37	77.66	61.17	29.55	7.11	0.00
87	HAWILIAN	Esperanza	434.00	2342.00	0.26	0.00	2.89	11.98	19.59	32.26	29.13	61.09	75.12	58.99	14.98	17.85	0.17
88	HUBANG	Bunawan	425.00	2077.00	1.00	1.75	3.01	1.18	1.41	13.88	23.21	30.10	52.94	39.06	13.41	12.14	0.39
89	HUBANG	San Francisco	425.00	2077.00	1.00	1.75	3.01	1.18	1.41	13.88	23.21	30.10	52.94	39.06	13.41	12.14	0.39
90	ILIHAN	Sibagat	218.00	997.00	0.00	0.00	3.10	0.92	6.88	17.89	11.43	46.88	73.85	58.72	6.42	3.77	0.20
91	IMELDA	Bunawan	217.00	992.00	1.20	0.00	1.20	3.69	51.61	41.01	24.02	65.63	72.35	57.14	0.46	1.73	3.33
92	JOHNSON	Loreto	220.00	1182.00	0.00	0.00	1.84	0.00	100.00	54.55	31.05	67.23	88.64	84.09	3.18	10.66	0.59
93	KAPATUNGAN	Trento	818.00	4043.00	0.00	0.00	11.27	3.91	27.26	18.70	20.78	42.69	61.61	46.21	0.00	5.92	0.00
94	KARAOS	San Francisco	434.00	2148.00	0.00	0.00	2.67	1.38	21.66	11.29	23.94	25.59	34.79	22.35	3.92	10.49	0.65
95	KASAPA I	La Paz	355.00	1803.00	2.51	0.00	9.50	15.49	85.92	61.13	59.09	71.50	84.51	78.31	6.20	10.42	0.83
96	KATIPUNAN V	Veruela	211.00	980.00	0.00	0.00	1.71	2.84	91.00	63.51	27.13	58.91	76.30	59.24	45.97	12.50	0.00
97	KAUSWAGAN L	Loreto	528.00	2555.00	0.42	0.00	1.67	2.27	64.96	84.66	50.00	76.54	95.08	87.88	0.38	8.71	0.04
98	KAUSWAGAN S	Sibagat	85.00	343.00	0.00	0.00	0.00	5.88	17.65	25.88	22.67	66.67	71.76	56.47	14.12	3.68	1.46
99	KINAMAYBAY	Esperanza	92.00	532.00	2.33	5.00	0.78	13.04	36.96	83.70	29.37	80.49	82.61	63.04	4.35	17.07	0.00
100	KIOYA	Sibagat	132.00	687.00	0.78	7.14	27.34	4.55	57.58	56.82	34.27	59.76	85.61	76.52	30.30	6.55	0.15
101	KULAMBUGAN	Sibagat	265.00	1474.00	0.35	0.00	1.05	1.13	23.02	63.02	30.73	79.39	86.79	77.36	30.19	4.31	2.17
102	LA FLORA	Talacogon	176.00	955.00	0.00	0.00	0.56	0.00	91.48	84.66	40.09	81.73	73.86	60.23	0.00	2.64	0.00
103	LA FORTUNA	Veruela	826.00	4300.00	1.06	0.00	1.33	5.81	43.58	44.19	23.74	47.41	66.46	49.64	41.65	6.35	2.63
104	LA PERIAN	Prosperidad	174.00	835.00	0.00	0.00	0.00	0.57	44.83	44.83	35.33	63.46	86.21	69.54	2.30	5.03	3.71
105	LA PURISIMA	Prosperidad	402.00	2238.00	0.00	0.00	0.00	0.50	67.91	57.96	42.00	80.75	90.30	81.34	39.30	28.95	0.13
106	LA SUERTE	Prosperidad	294.00	1418.00	0.46	0.00	0.00	2.04	19.05	13.95	18.84	46.81	72.45	58.50	11.56	15.62	0.07
107	LA UNION	Prosperidad	278.00	1375.00	1.23	0.00	4.94	0.36	77.70	47.84	33.20	61.54	72.66	55.40	18.71	10.40	0.07
108	LABNIG	Talacogon	502.00	2464.00	0.27	0.00	0.00	0.80	43.43	26.49	22.68	45.17	70.32	57.17	2.19	12.03	0.04
109	LACARIDAD	Prosperidad	280.00	1503.00	0.00	2.27	10.53	0.71	16.43	38.93	22.60	58.08	81.43	67.50	0.36	9.04	0.00
110	LADGADAN	San Francisco	133.00	645.00	0.18	0.00	10.32	6.02	95.49	65.41	19.43	54.55	88.72	75.94	10.53	1.95	0.00
111	LANGASIAN	La Paz	136.00	752.00	0.74	0.00	0.00	0.00	96.32	78.68	36.81	96.47	90.44	85.29	56.62	8.98	0.00
112	LANGKILAAN	Trento	362.00	1725.00	0.00	0.00	8.28	1.38	8.29	10.22	22.58	52.84	55.80	37.29	0.00	7.37	0.00
113	LAPINIGAN	San Francisco	846.00	3953.00	0.00	0.00	6.26	4.02	8.16	23.52	19.88	33.26	38.30	27.30	2.25	14.97	0.28
114	LAS NAVAS	Prosperidad	271.00	1426.00	0.37	2.63	11.90	2.95	45.39	31.73	17.77	53.64	82.29	73.43	1.11	11.14	0.07
115	LIBERTAD B	Bunawan	1129.00	5718.00	0.25	0.00	0.76	3.72	21.17	19.40	31.46	52.11	63.68	48.72	0.53	14.70	1.29
116	LIBERTAD P	Prosperidad	176.00	869.00	0.00	0.00	18.47	0.57	23.30	44.89	36.77	56.38	75.57	66.48	1.70	11.11	0.12
117	LIBUAC	Rosario	519.00	2302.00	0.00	0.00	3.23	5.59	17.92	10.21	19.95	46.26	59.54	43.74	9.83	24.55	1.09
118	LIMOT	Veruela	155.00	832.00	2.38	0.00	1.79	0.00	96.13	88.39	17.55	63.75	70.32	54.84	26.45	0.58	0.60
119	LOS ARCOS	Prosperidad	503.00	2484.00	0.27	1.82	5.21	9.74	10.54	36.98	22.70	47.53	65.41	48.31	1.19	1.85	0.08
120	LUCAC	Prosperidad	124.00	619.00	0.00	0.00	4.65	0.00	25.81	40.32	28.69	60.32	67.74	39.52	5.65	3.25	0.16
121	LUCENA	Prosperidad	600.00	3123.00	0.83	0.00	4.75	6.33	42.33	37.00	30.10	48.75	68.00	49.33	31.00	7.29	0.22
122	LYDIA	La Paz	205.00	1132.00	4.65	0.00	13.57	13.66	93.66	92.68	48.36	84.68	93.17	89.76	64.39	10.43	0.97
123	MAASIN	Esperanza	215.00	1156.00	1.90	0.00	9.05	0.47	45.12	65.58	23.04	56.88	71.16	57.21	4.19	1.45	0.17
124	MABUHAY B	Bayugan	302.00	1656.00	1.31	0.00	0.00	3.64	0.66	18.21	19.81	34.17	48.34	29.80	8.61	6.44	0.36
125	MABUHAY P	Prosperidad	345.00	1851.00	0.00	0.00	4.73	10.72	31.01	50.72	30.83	70.20	63.48	39.71	8.12	12.86	0.05
126	MAC ARTHUR	San Luis	40.00	171.00	0.00	0.00	0.00	0.00	32.50	70.00	48.00	75.00	57.50	47.50	2.50	4.26	11.70
127	MAGAUD	Loreto	420.00	2214.00	0.23	0.00	13.29	10.24	45.95	58.57	21.94	42.25	83.81	76.19	35.00	7.03	0.18
128	MAGKALAPE	Sibagat	35.00	181.00	4.00	0.00	0.00	5.71	8.57	71.43	57.89	100.00	91.43	85.71	2.86	8.57	0.00
129	MAGKIANGKANG	Bayugan	406.00	1792.00	0.66	1.82	0.66	5.91	12.07	21.67	21.70	49.44	61.58	46.80	17.73	3.59	6.03
130	MAGSAYSAY P	Prosperidad	324.00	1679.00	0.00	0.00	2.41	5.25	25.31	33.02	23.20	51.58	86.11	76.54	26.54	53.14	0.00
131	MAGSAYSAY S	Sibagat	156.00	898.00	0.00	0.00	7.56	21.15	80.77	61.54	43.87	67.71	89.10	82.05	14.10	3.17	0.89
132	MAGSAYSAY V	Veruela	183.00	830.00	0.78	0.00	0.00	0.00	67.76	16.94	31.43	54.55	56.83	37.70	54.64	3.61	1.93
133	MAHAGKOT	Bayugan	150.00	735.00	0.00	0.00	9.70	3.33	26.00	38.00	18.18	45.45	49.33	27.33	3.33	6.02	0.00
134	MAHAGSAY	San Luis	144.00	871.00	1.12	0.00	0.56	0.00	19.44	63.19	53.18	91.92	100.00	100.00	0.69	10.90	0.00
135	MAHAPAG	Esperanza	117.00	634.00	0.00	0.00	0.00	0.85	81.20	61.54	33.58	77.11	91.45	84.62	0.00	2.07	0.16
136	MAHARLIKA	Talacogon	133.00	703.00	1.52	0.00	13.64	0.00	99.25	100.00	29.56	81.69	95.49	86.47	0.75	8.42	0.00
137	MAHAYAG	Bayugan	105.00	566.00	1.67	0.00	0.00	0.00	96.19	41.90	28.57	60.71	71.43	54.29	0.95	1.20	0.00
138	MAHAYAHAY S	Sibagat	268.00	1376.00	1.60	0.00	1.60	7.84	29.48	5.97	19.31	34.10	80.22	65.67	0.37	3.43	0.15
139	MAHAYAHAY SL	San Luis	155.00	918.00	1.88	0.00	0.00	1.29	97.42	92.26	45.37	93.75	97.42	94.19	0.00	7.35	0.00
140	MALIGAYA	Rosario	265.00	1185.00	0.00	0.00	0.69	1.89	9.06	35.47	28.36	40.52	39.62	29.06	21.51	5.36	1.10
141	MALIWANAG	Esperanza	34.00	186.00	0.00	0.00	2.38	5.88	23.53	82.35	84.62	100.00	88.24	70.59	0.00	3.17	0.00
142	MAMBALILI	Bunawan	308.00	1645.00	2.00	0.00	3.33	3.57	87.99	35.06	24.92	64.42	73.70	62.01	28.57	14.96	7.36
143	MANAT	Trento	686.00	3364.00	1.55	0.00	16.63	1.46	27.26	17.64	30.63	51.70	68.08	51.60	9.04	11.92	3.39
144	MAPAGA	Prosperidad	268.00	1435.00	0.41	0.00	0.00	1.49	61.19	42.54	23.74	60.00	82.84	73.88	7.09	6.88	0.00
145	MARBON	Talacogon	181.00	935.00	0.00	0.00	3.16	14.36	86.74	57.46	29.70	64.37	92.82	87.29	0.00	5.08	0.00
146	MARCELINA	Bayugan	631.00	3260.00	1.53	1.19	2.49	0.16	19.97	19.97	24.13	43.31	70.36	59.27	0.95	7.64	0.31
147	MARFIL	Rosario	358.00	1934.00	0.74	0.00	1.49	1.40	14.25	21.23	28.61	63.47	82.12	75.42	37.43	2.79	0.93
148	MASAYAN	Veruela	209.00	1087.00	0.52	0.00	1.04	4.31	45.45	41.63	19.28	38.74	74.16	65.07	52.15	11.11	0.28
149	MATI	San Francisco	224.00	1101.00	1.01	0.00	6.49	0.00	21.88	23.21	18.27	42.86	36.61	24.55	4.91	7.47	1.27
150	MAYGATASAN	Bayugan	737.00	3561.00	0.62	0.00	0.83	5.43	0.14	19.54	22.30	34.06	50.20	35.01	0.00	4.61	0.62
151	MILAGROS	Esperanza	153.00	845.00	0.68	0.00	1.37	5.23	69.93	54.25	25.77	77.69	88.89	76.47	51.63	10.23	3.08
152	MONTEVESTA	Bayugan	125.00	619.00	0.00	0.00	11.76	0.80	90.40	36.80	38.24	68.97	87.20	78.40	0.00	13.03	0.00
153	MT. ARARAT	Bayugan	152.00	735.00	0.00	0.00	0.00	0.00	32.24	48.68	30.88	66.67	72.37	51.97	6.58	2.18	2.72
154	MT. CARMEL	Bayugan	397.00	1903.00	0.00	0.00	8.63	0.76	19.90	35.01	27.99	57.89	76.83	65.24	13.35	9.84	1.26
155	MT. OLIVE	Bayugan	363.00	1647.00	0.00	0.00	4.18	4.68	9.92	18.73	22.37	33.53	69.70	55.10	4.68	10.55	3.28
156	NAPO	Prosperidad	163.00	788.00	0.00	0.00	21.60	0.00	43.56	38.04	23.08	62.96	77.91	67.48	41.72	7.39	0.00
157	NATO	Esperanza	303.00	1481.00	0.76	2.63	0.00	3.96	13.53	47.52	20.86	60.27	71.29	49.50	11.22	5.03	2.03
158	NEW GINGOOG	Esperanza	84.00	435.00	2.00	0.00	2.00	4.76	98.81	44.05	19.79	70.37	47.62	25.00	19.05	12.50	3.68
159	NEW MAUG	Prosperidad	263.00	1340.00	0.00	0.00	6.39	2.66	95.82	41.44	22.97	51.59	69.20	57.03	17.11	5.14	0.22
160	NEW SALEM	Bayugan	156.00	709.00	1.02	0.00	16.33	0.00	32.05	53.21	27.61	73.68	69.87	50.64	13.46	0.30	0.42
161	NEW TUBIGUN	Sibagat	275.00	1456.00	3.24	0.00	5.04	0.73	79.27	56.36	38.93	67.07	93.09	84.00	37.09	5.69	1.58
162	NEW VISAYAS SF	San Francisco	229.00	1071.00	0.00	0.00	2.02	2.62	99.56	48.03	23.79	41.24	41.05	29.26	10.48	5.85	0.47
163	NEW VISAYAS T	Trento	143.00	663.00	1.02	8.33	23.47	0.00	19.58	17.48	17.04	57.81	51.05	34.27	0.00	1.94	0.00
164	NOLI	Bayugan	671.00	3366.00	1.17	0.00	3.71	1.04	22.21	11.62	23.06	35.63	69.15	57.23	0.15	8.79	0.68
165	NOVELE	Rosario	337.00	1673.00	0.33	0.00	1.00	8.01	27.60	20.47	27.27	70.13	89.02	75.96	1.78	8.60	0.24
166	NUEVA ERA	Bunawan	188.00	811.00	0.00	0.00	6.14	3.72	92.55	61.17	19.15	59.26	67.55	52.66	26.06	17.43	0.49
167	NUEVA GRACIA	Veruela	231.00	1278.00	0.48	0.00	2.40	0.43	20.35	53.68	27.43	65.13	84.85	77.49	29.00	24.09	0.00
168	NUEVO TRABAJO	San Luis	268.00	1295.00	0.00	0.00	12.35	0.00	24.63	78.36	32.45	60.58	75.37	61.94	8.21	6.92	0.08

Brgy__Name	Municipality	HH	POP	P_CHILDTH	P_WM_DIED	P_MALNOUR	P_MKSHIFT	P_SAFEW	P_TOILET	P_NOTEL	P_1316NOHI	P_POV_TR	P_FOODTR	P_FDSHORT	P_LABUN	P_VICT_CR
169 ODIONG	Esperanza	73.00	415.00	0.00	0.00	0.00	32.88	83.56	68.49	36.11	90.20	90.41	73.97	58.90	3.45	1.93
170 ORMACA	San Francisco	134.00	697.00	0.84	0.00	20.41	4.48	35.82	25.37	22.05	23.33	48.51	38.06	2.24	12.83	0.43
171 OROMICA	Esperanza	243.00	1391.00	0.38	0.00	9.62	2.47	21.81	41.56	44.01	73.08	74.49	60.49	24.69	5.81	1.22
172 OSMENA B	La Paz	280.00	1530.00	3.07	0.00	1.32	2.50	14.29	32.14	21.27	54.55	80.71	73.21	16.79	4.48	2.29
173 OSMENA L	Bayugan	205.00	1143.00	1.55	0.00	15.54	1.95	52.20	59.02	24.51	51.24	76.59	67.80	41.95	8.61	1.22
174 PADIAY	Sibagat	280.00	1622.00	0.43	0.00	0.00	0.71	77.86	76.43	29.29	75.38	81.79	65.71	11.79	4.23	1.73
175 PAG - ASA	Sta. Josefa	144.00	652.00	0.00	0.00	1.10	4.86	77.78	2.08	20.35	55.71	77.08	63.89	2.08	4.37	1.69
176 PANAGANGAN	La Paz	475.00	2533.00	0.56	0.00	10.31	3.16	69.47	41.05	22.90	43.23	62.11	50.53	11.16	11.39	0.08
177 PANAYTAY	Bayugan	117.00	581.00	1.23	0.00	0.00	0.85	99.15	77.78	25.51	65.52	65.81	44.44	50.43	4.08	0.86
178 PANGYAN	Trento	91.00	452.00	1.22	0.00	24.39	0.00	98.90	90.11	66.99	93.02	80.22	71.43	70.33	12.80	0.00
179 PASTA	San Francisco	498.00	2391.00	0.00	0.00	5.90	4.62	3.41	19.28	23.64	39.84	31.53	16.87	12.65	7.62	0.92
180 PATIN - AY	Prosperidad	1366.00	7259.00	0.79	0.00	3.56	1.61	19.62	17.94	22.44	35.14	37.85	25.33	2.20	12.51	0.51
181 PATROCENIO	Sta. Josefa	334.00	1618.00	0.39	0.00	11.67	3.59	30.54	19.76	25.37	50.89	82.04	70.96	5.69	8.17	0.00
182 PEREZ	Sibagat	162.00	908.00	1.69	7.14	0.56	3.09	58.02	77.78	37.76	85.09	80.86	66.67	6.17	4.42	0.00
183 PIGLAWIGAN	Esperanza	273.00	1443.00	0.44	0.00	0.88	2.56	0.37	34.07	17.54	48.19	58.97	37.36	8.06	13.62	0.00
184 PINAGALAAN	Bayugan	209.00	1124.00	0.84	0.00	10.04	0.96	5.74	50.24	42.26	70.48	77.51	61.24	3.35	2.59	6.23
185 PISAAN	San Francisco	428.00	2072.00	0.00	0.00	7.24	7.01	10.98	15.65	23.50	35.41	49.77	31.54	21.50	11.75	0.53
186 POLICARPO	San Luis	83.00	429.00	0.00	0.00	0.97	1.20	96.39	86.75	42.71	91.43	91.57	86.75	0.00	21.59	0.00
187 PULANG LUPA	Trento	541.00	2585.00	0.00	0.00	2.81	0.18	33.64	20.70	24.90	43.85	59.70	44.18	0.18	15.60	0.00
188 REMEDIOS	Esperanza	248.00	1243.00	0.97	0.00	0.00	1.21	11.29	16.94	26.10	70.00	78.63	61.29	8.47	7.19	0.40
189 RIZAL	San Francisco	155.00	687.00	0.00	0.00	3.30	0.00	90.97	29.68	31.82	36.92	58.71	42.58	22.58	7.72	0.15
190 SABANG ADGAWAN	La Paz	249.00	1317.00	0.79	0.00	0.00	0.00	98.80	91.57	21.11	67.12	81.53	70.28	9.64	11.31	0.23
191 SABANG GIBONG	Talacogon	146.00	773.00	0.81	0.00	1.61	15.07	100.00	99.32	25.77	67.07	89.04	79.45	1.37	0.00	0.00
192 SABOD	Loreto	267.00	1343.00	0.83	0.00	5.81	3.00	100.00	96.25	34.08	80.15	94.38	88.39	3.00	14.69	0.15
193 SAGMONE	Bayugan	214.00	1199.00	0.56	0.00	1.69	10.28	7.01	29.91	31.82	52.86	89.25	79.91	5.61	13.21	0.00
194 SAGUMA	Bayugan	418.00	2097.00	0.00	0.00	4.91	6.70	21.53	53.35	22.05	40.34	67.70	52.63	22.73	4.92	2.81
195 SAGUNTO	La Paz	304.00	1479.00	0.00	0.00	1.76	0.00	47.04	50.33	19.73	55.84	54.61	37.83	21.71	11.41	0.74
196 SALIMBOGAON	Prosperidad	137.00	687.00	1.87	0.00	7.48	0.00	18.25	54.01	17.52	51.16	54.01	16.06	3.65	4.08	0.29
197 SALUG	Esperanza	222.00	1228.00	0.43	0.00	0.00	12.16	28.38	37.84	38.97	81.43	80.63	70.72	65.77	8.18	0.41
198 SALVACION B	Bayugan	918.00	4617.00	0.85	0.00	1.41	1.85	11.87	16.67	26.00	42.32	64.38	45.64	2.18	7.64	0.63
199 SALVACION P	Prosperidad	492.00	2456.00	0.49	0.00	10.19	2.03	16.87	20.33	24.95	56.97	60.57	45.73	7.93	14.38	1.63
200 SALVACION T	Trento	389.00	1846.00	0.00	0.00	20.23	0.00	65.55	22.11	29.97	56.82	52.96	28.79	8.23	18.07	0.22
201 SAMPAGUITA	Veruela	1012.00	4796.00	0.85	0.00	5.68	11.66	12.35	26.78	24.47	45.90	57.71	37.85	38.64	4.63	2.13
202 SAN AGUSTIN B	Bayugan	118.00	628.00	0.00	0.00	40.95	0.85	18.64	64.41	29.38	47.95	86.44	81.36	21.19	8.21	7.01
203 SAN AGUSTIN T	Talacogon	562.00	2946.00	0.86	0.00	0.43	0.89	30.60	32.03	21.68	43.69	47.51	29.89	1.78	9.82	0.48
204 SAN ANDRES B	Bunawan	428.00	2119.00	1.24	0.00	1.24	2.10	13.32	21.26	24.55	46.41	65.19	51.40	17.52	11.86	1.23
205 SAN GABRIEL	Veruela	332.00	1528.00	1.11	2.00	0.00	9.34	49.70	77.11	24.05	50.32	70.18	52.41	38.55	3.16	1.44
206 SAN IGNACIO	Trento	115.00	604.00	1.40	4.76	26.57	1.74	30.43	34.78	26.96	74.07	84.35	62.61	50.43	2.14	1.49
207 SAN ISIDRO B	Bayugan	178.00	960.00	0.00	0.00	10.53	2.81	30.90	37.64	17.37	35.92	61.80	47.19	11.80	1.23	0.21
208 SAN ISIDRO E	Esperanza	60.00	308.00	0.00	12.50	0.00	0.00	1.67	51.67	27.85	86.21	86.67	73.33	0.00	7.95	0.00
209 SAN ISIDRO L	Loreto	238.00	1253.00	0.99	0.00	12.87	4.62	100.00	41.60	28.46	50.35	81.93	71.43	42.86	10.03	0.56
210 SAN ISIDRO S	Sibagat	179.00	894.00	0.57	0.00	14.77	0.00	98.32	79.89	36.56	77.14	81.01	69.83	48.60	1.76	0.78
211 SAN ISIDRO SF	San Francisco	560.00	2808.00	0.00	0.00	1.76	7.50	1.61	11.25	19.49	25.09	47.86	32.86	0.89	7.23	0.32
212 SAN ISIDRO SL	San Luis	135.00	692.00	0.00	0.00	0.00	1.48	0.00	75.56	29.03	69.88	95.56	91.11	0.00	2.09	0.00
213 SAN ISIDRO TA	Talacogon	132.00	642.00	0.00	0.00	1.20	0.00	92.42	10.61	17.11	17.39	27.27	11.36	0.76	18.68	0.16
214 SAN ISIDRO TR	Trento	314.00	1649.00	2.85	0.00	13.52	0.32	86.94	7.96	18.18	52.98	69.11	50.96	28.03	9.53	12.67
215 SAN JOAQUIN	Prosperidad	311.00	1513.00	0.43	0.00	27.66	6.11	45.98	60.13	19.59	69.05	88.10	78.14	17.36	5.27	0.07
216 SAN JUAN	Bayugan	682.00	3519.00	0.17	0.00	0.17	11.44	37.83	51.17	43.49	69.75	72.58	57.62	16.13	4.80	6.48
217 SAN LORENZO	Prosperidad	243.00	1368.00	1.54	0.00	12.31	0.82	50.21	63.37	30.74	73.85	88.48	80.25	16.87	1.72	0.00
218 SAN MARCOS	Bunawan	160.00	928.00	3.43	0.00	1.71	1.25	100.00	80.00	38.03	78.43	70.00	57.50	51.88	7.59	8.41
219 SAN MARIANO	Loreto	293.00	1492.00	2.22	3.57	5.93	6.48	97.27	86.35	29.10	72.61	92.15	85.67	28.67	18.46	0.54
220 SAN MARTIN	Prosperidad	381.00	2024.00	0.31	0.00	7.79	4.72	62.47	43.57	30.99	56.44	70.34	51.71	9.45	18.58	0.00
221 SAN NICOLAS	Talacogon	384.00	1829.00	1.86	0.00	3.72	1.04	70.57	19.53	24.09	35.82	61.72	48.96	0.00	15.72	0.00
222 SAN PATRICIO	La Paz	254.00	1380.00	5.15	0.00	41.54	1.57	34.25	83.07	51.65	92.86	75.98	59.84	18.11	11.16	0.65
223 SAN PEDRO P	Prosperidad	120.00	597.00	3.09	0.00	18.56	5.83	68.33	31.67	20.95	45.76	70.83	58.33	12.50	5.75	0.17
224 SAN PEDRO S	San Luis	129.00	664.00	0.00	0.00	0.00	0.00	41.09	86.05	46.62	73.61	93.02	90.70	18.60	5.59	0.30
225 SAN RAFAEL	Prosperidad	388.00	1898.00	0.00	0.00	5.95	9.79	56.70	29.38	20.94	44.02	65.98	52.06	1.29	10.39	0.05
226 SAN ROQUE T	Trento	200.00	1050.00	2.84	0.00	21.28	13.50	24.50	9.00	21.20	40.83	49.50	27.50	10.00	24.40	0.19
227 SAN SALVADOR	Prosperidad	300.00	1529.00	0.83	0.00	7.44	2.33	15.67	22.33	30.61	56.76	66.33	52.00	17.00	7.98	0.39
228 SAN TEODORO	Bunawan	1068.00	5384.00	0.42	0.93	4.44	6.74	15.54	18.16	20.69	32.88	45.97	35.11	23.03	15.10	6.80
229 SAN TORIBIO	Esperanza	443.00	2254.00	0.56	0.00	2.22	11.06	51.02	19.86	26.84	60.31	56.66	35.21	31.83	10.22	8.78
230 SAN VICENTE E	Esperanza	67.00	361.00	1.25	0.00	5.00	0.00	98.51	59.70	76.84	96.97	100.00	94.03	64.18	1.25	0.28
231 SAN VICENTE L	Loreto	344.00	1747.00	2.14	0.00	6.05	3.78	38.66	36.05	28.94	54.49	82.56	74.71	3.49	7.71	0.00
232 SAN VICENTE P	Prosperidad	654.00	3133.00	0.64	0.00	4.49	2.45	95.72	41.74	19.21	44.03	56.57	32.72	1.99	4.92	0.00
233 SAN VICENTE S	Sibagat	201.00	970.00	0.69	4.17	4.83	1.49	5.47	11.44	18.79	26.80	44.28	28.86	3.48	15.50	0.93
234 SANTIAGO	San Luis	78.00	420.00	0.00	0.00	0.00	0.00	57.69	51.28	27.18	72.92	100.00	100.00	0.00	1.55	0.00
235 SAWAGAN	Veruela	158.00	849.00	1.26	0.00	2.52	0.00	58.86	41.14	31.82	57.89	80.38	63.92	52.53	4.08	0.71
236 SAYON	Sta. Josefa	457.00	2361.00	0.25	0.00	6.70	2.41	33.92	13.57	29.73	60.82	77.90	66.30	7.66	4.38	0.59
237 SIGUNDA	Esperanza	31.00	159.00	0.00	0.00	0.00	0.00	70.97	67.74	85.29	94.12	83.87	77.42	0.00	0.00	0.00
238 SINACUNGAN	Esperanza	23.00	156.00	0.00	0.00	0.00	0.00	100.00	91.30	64.00	88.89	91.30	82.61	60.87	15.52	0.00
239 SINAI	Sibagat	130.00	593.00	1.22	0.00	17.07	0.00	74.62	32.31	24.58	61.19	77.69	63.85	35.38	11.23	0.67
240 SINOBONG	Veruela	592.00	3032.00	1.00	1.23	0.00	1.01	24.16	29.39	29.95	47.78	65.54	51.35	5.74	1.62	1.29
241 SISIMON	Veruela	154.00	730.00	1.63	0.00	4.07	0.00	87.01	42.86	27.97	52.63	74.03	54.55	72.73	7.95	43.01
242 STA. ANA	San Francisco	211.00	1022.00	0.31	0.00	10.73	1.42	5.21	19.91	26.13	40.91	63.51	42.18	14.22	7.60	1.66
243 STA. CRUZ R	Rosario	871.00	4242.00	1.04	0.00	0.00	2.87	11.71	18.48	20.08	34.29	65.56	48.79	4.59	8.60	0.24
244 STA. CRUZ S	Sibagat	95.00	567.00	0.91	11.11	33.64	0.00	44.21	70.53	30.70	79.69	66.32	49.47	20.00	4.08	4.06
245 STA. CRUZ V	Veruela	191.00	927.00	1.20	0.00	3.61	0.00	59.16	57.07	25.82	57.30	78.01	63.87	55.50	5.46	1.19
246 STA. FE	Esperanza	242.00	1314.00	0.00	0.00	0.87	1.24	1.65	23.97	19.85	53.50	61.98	44.21	16.94	5.16	0.91
247 STA. INES	San Luis	299.00	1436.00	0.42	0.00	0.42	0.33	13.38	58.19	25.40	57.14	71.24	59.20	0.00	3.56	0.00
248 STA. IRENE B	Bayugan	456.00	2420.00	1.70	0.00	0.85	2.85	27.63	23.03	24.57	50.18	63.38	50.22	8.99	7.12	1.45

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249 STA. IRENE P	Prosperidad	1019.00	5186.00	0.40	0.76	1.19	10.30	8.93	14.23	28.62	49.30	46.22	27.97	6.48	15.56	1.43
250 STA. ISABEL	Sta. Josefa	316.00	1576.00	1.69	0.00	5.51	0.32	26.27	42.72	17.02	32.97	69.30	56.01	0.63	8.61	0.70
251 STA. MARIA S	Sibagat	119.00	638.00	1.41	0.00	4.23	0.00	94.96	43.70	20.59	67.16	86.55	78.99	36.13	0.80	0.47
252 STA. MARIA T	Trento	518.00	2720.00	0.00	0.00	9.95	5.41	40.54	13.71	23.76	43.87	80.31	68.53	15.44	9.97	0.48
253 STA. RITA	San Luis	42.00	253.00	0.00	14.29	0.00	0.00	100.00	92.86	32.08	76.19	97.62	97.62	78.57	20.59	0.00
254 STA. TERESA	Loreto	219.00	1155.00	0.84	2.78	4.62	10.50	56.16	70.78	31.89	72.88	86.76	79.00	31.05	10.92	0.26
255 STA. TERESITA	Bayugan	286.00	1379.00	0.48	0.00	0.48	3.50	18.53	39.51	25.11	48.09	60.49	31.47	1.05	8.24	0.51
256 STO. NINO B	Bayugan	342.00	1820.00	0.80	1.69	0.27	7.02	45.61	71.93	35.57	76.34	73.68	58.48	6.73	10.42	8.35
257 STO. NINO L	Loreto	174.00	880.00	1.10	0.00	1.66	7.47	44.25	74.14	37.50	65.33	82.18	71.84	10.34	6.17	1.02
258 STO. TOMAS	Loreto	539.00	2970.00	1.46	1.06	8.03	2.78	32.47	38.22	26.73	50.76	75.32	65.86	30.43	14.05	0.24
259 TABONTABON	Sibagat	465.00	2531.00	0.26	0.00	1.81	3.23	95.48	12.90	27.04	71.72	64.73	49.68	5.59	13.48	0.16
260 TAGABASI	Esperanza	112.00	708.00	0.00	0.00	0.82	1.79	16.07	8.04	29.37	66.29	84.82	73.21	31.25	9.84	0.42
261 TAGANAHAO	Bayugan	57.00	305.00	0.00	0.00	7.27	5.26	0.00	36.84	20.29	64.10	94.74	77.19	19.30	3.31	0.00
262 TAGAPUA	San Francisco	400.00	2105.00	0.58	1.47	5.81	2.00	71.75	39.25	24.47	37.02	74.25	64.75	13.50	18.21	0.05
263 TAGBALILI	Esperanza	59.00	364.00	0.00	0.00	0.00	3.39	13.56	37.29	26.92	81.08	96.61	91.53	0.00	4.82	0.00
264 TAGBAYAGAN	Rosario	335.00	1582.00	0.00	0.00	2.20	3.58	17.01	7.46	35.82	55.56	59.10	39.10	9.25	11.07	0.00
265 TAGLATAWAN	Bayugan	2290.00	11503.00	0.74	0.33	1.54	3.23	2.23	11.09	22.61	36.48	48.82	29.04	4.54	17.61	3.19
266 TAGLIBAS	Bayugan	82.00	391.00	2.90	0.00	18.84	2.44	10.98	46.34	20.45	74.19	71.95	60.98	13.41	6.56	0.00
267 TAGUBAY	Bayugan	140.00	670.00	0.00	0.00	0.00	17.86	50.00	33.57	22.03	44.59	60.00	43.57	52.14	1.69	2.54
268 TAGUYANGO	Sibagat	121.00	610.00	0.00	0.00	26.88	2.48	15.70	69.42	23.39	49.23	79.34	66.94	6.61	12.14	0.00
269 TAHINA	Esperanza	114.00	643.00	0.76	0.00	0.00	7.02	20.18	57.89	38.97	83.58	82.46	67.54	44.74	7.01	0.00
270 TANDANG SORA	San Luis	146.00	747.00	0.00	0.00	1.33	0.68	7.53	49.32	29.03	62.96	84.25	66.44	22.60	0.83	0.54
271 TAPAZ	Sta. Josefa	234.00	1241.00	1.10	0.00	0.00	0.43	1.71	9.40	22.18	48.76	75.64	61.11	8.12	14.92	1.21
272 TUDELA	Trento	294.00	1521.00	0.00	0.00	11.28	1.02	35.71	19.73	13.06	63.16	62.24	43.88	1.36	6.68	0.00
273 VALENTINA L	La Paz	308.00	1796.00	1.75	0.00	20.99	0.97	46.10	70.78	36.29	73.87	77.60	65.91	22.08	11.91	0.06
274 VERDU	Bayugan	270.00	1318.00	2.00	0.00	0.80	0.74	32.59	30.37	32.05	66.67	64.44	49.26	19.63	3.05	7.28
275 VILLA PAZ	La Paz	303.00	1615.00	0.00	0.00	1.79	0.00	40.59	52.15	33.95	58.90	73.60	59.41	3.96	13.60	0.00
276 VILLA UNDAYON	Prosperidad	246.00	1286.00	0.00	0.00	23.01	1.63	58.94	35.37	38.25	69.17	78.46	68.29	9.76	8.67	0.78
277 VILLANGIT	Sibagat	160.00	1001.00	0.48	0.00	4.35	4.38	88.75	64.38	34.25	69.75	86.88	75.00	1.25	7.89	12.69
278 VIOLANTA	Loreto	138.00	689.00	0.00	0.00	0.00	0.72	6.52	51.45	22.14	46.91	73.19	55.80	7.97	3.47	0.15
279 WALOE	Loreto	305.00	1665.00	0.68	0.00	2.03	5.25	9.18	55.41	28.96	51.25	72.13	58.69	15.41	22.08	0.24
280 WASIAN	Rosario	686.00	3427.00	1.41	0.00	0.00	2.62	15.74	9.91	19.70	20.37	78.57	67.06	7.14	7.00	0.15
281 WAWA	Bayugan	226.00	1259.00	0.49	0.00	9.76	0.44	14.16	11.06	29.57	62.91	76.11	65.49	37.17	11.63	9.85
282 ZAMORA	Talacogon	183.00	1004.00	1.55	0.00	3.61	0.00	25.14	45.90	29.00	72.50	76.50	66.12	49.73	1.85	0.50
283 ZILLOVIA	Talacogon	772.00	4169.00	0.48	0.00	7.31	1.17	15.67	28.50	21.33	37.76	57.64	40.93	8.16	9.67	0.14

Descriptive statistics (Quantitative data):

Statistic	CBMS1	CBMS2	CBMS3	CBMS4	CBMS5	CBMS6	CBMS7
No. of observations	295	295	295	295	295	295	295
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.40
Maximum	4.90	12.50	83.70	32.90	98.50	100.00	100.00
Mean	0.71	0.95	5.00	3.59	7.18	43.16	31.34
Standard deviation (n)	0.85	2.28	8.44	4.83	13.15	32.85	23.34

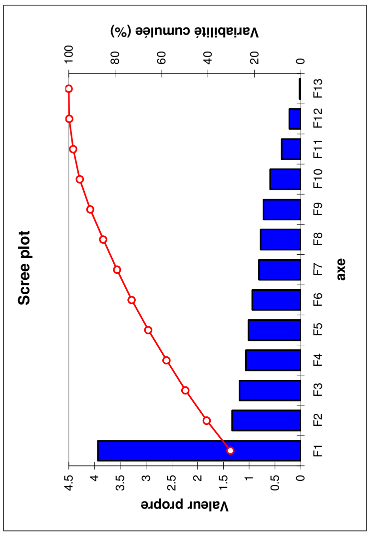
Statistic	CBMS8	CBMS9	CBMS10	CBMS11	CBMS12	CBMS13	CBMS14
No. of observations	295	295	295	295	295	295	295
Minimum	8.50	14.30	3.80	3.80	0.00	0.00	0.00
Maximum	97.00	100.00	100.00	100.00	90.10	53.10	43.00
Mean	29.63	59.50	72.77	58.72	18.21	9.03	1.22
Standard deviation (n)	12.46	17.10	16.51	19.51	20.05	6.56	3.50

CBMS1 : Proportion of children aged 0-5 years old who died
CBMS2 : Proportion of women who died due to pregnancy related causes
CBMS3 : Proportion of children aged 0-5 years old who are malnourished
CBMS4 : Proportion of households living in makeshift housing
CBMS5 : Proportion of households that are squatters
CBMS6 : Proportion of households without access to safe water supply
CBMS7 : Proportion of households without access to sanitary toilet facilities
CBMS8 : Proportion of children aged 6-12 years old who are not attending elementary school
CBMS9 : Proportion of children aged 13-16 years old who are not attending secondary school
CBMS10 : Proportion of households with income below the poverty threshold
CBMS11 : Proportion of households with income below the food (subsistence) threshold
CBMS12 : Proportion of households that experienced food shortage
CBMS13 : Proportion of persons who are unemployed
CBMS14 : Proportion of persons who were victims of crimes

Annex 10 – PCA outputs

Eigenvalues

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
Valeur propre	3.935	1.335	1.189	1.066	1.016	0.936	0.813	0.780	0.723	0.592	0.369	0.222	0.024
Variabilité (%)	30.266	10.272	9.150	8.201	7.817	7.199	6.253	6.002	5.563	4.553	2.836	1.708	0.183
% cumulé	30.266	40.537	49.687	57.888	65.705	72.904	79.156	85.158	90.721	95.274	98.110	99.817	100.000



Eigenvectors

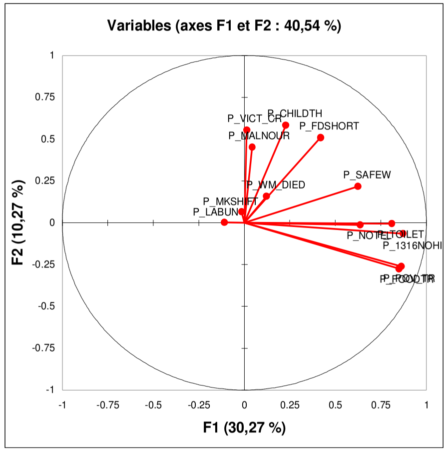
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
P_CHILDTH	0.114	0.505	0.086	-0.184	0.166	-0.354	-0.363	0.615	-0.093	-0.105	0.088	-0.018	0.013
P_WM_DIED	0.061	0.137	0.514	0.246	0.203	0.713	-0.129	0.135	-0.151	-0.123	-0.160	-0.067	0.013
P_MALNOUR	0.022	0.391	0.554	-0.110	0.162	-0.264	0.179	-0.437	0.445	0.099	-0.027	0.006	-0.012
P_MKSHIFT	-0.008	0.057	-0.395	0.227	0.807	-0.004	0.198	-0.056	0.128	-0.279	0.009	0.019	-0.013
P_SAFEW	0.315	0.188	-0.055	0.175	-0.186	-0.240	-0.098	-0.372	-0.392	-0.473	-0.459	0.061	0.008
P_TOILET	0.409	-0.004	0.087	0.031	-0.040	0.015	0.115	-0.175	-0.216	-0.207	0.758	-0.339	-0.009
P_NOTEL	0.321	-0.011	0.020	-0.240	0.028	-0.018	0.665	0.296	-0.138	0.158	-0.356	-0.367	0.057
P_1316NOHI	0.440	-0.056	0.063	-0.089	0.004	0.087	0.229	0.124	-0.005	0.025	0.128	0.832	-0.086
P_POV_TR	0.435	-0.225	-0.046	0.037	0.029	0.009	-0.288	0.009	0.369	0.042	-0.092	-0.071	0.722
P_FOODTR	0.429	-0.238	-0.035	0.055	0.016	-0.008	-0.289	0.051	0.364	0.046	-0.158	-0.206	-0.683
P_FDSHORT	0.211	0.441	-0.302	0.304	0.021	0.105	-0.096	-0.180	-0.185	0.700	0.016	-0.010	-0.008
P_LABUN	-0.056	0.001	0.128	0.794	-0.257	-0.255	0.261	0.319	0.206	-0.057	0.056	0.010	0.022
P_VICT_CR	0.007	0.479	-0.374	-0.135	-0.385	0.393	0.140	0.037	0.435	-0.312	0.029	-0.034	-0.010

Coordinates of the variables

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
P_CHILDTH	0.227	0.584	0.093	-0.190	0.168	-0.343	-0.327	0.543	-0.079	-0.081	0.053	-0.008	0.002
P_WM_DIED	0.121	0.158	0.561	0.254	0.205	0.690	-0.116	0.119	-0.128	-0.095	-0.097	-0.031	0.002
P_MALNOUR	0.043	0.452	0.604	-0.114	0.164	-0.255	0.161	-0.386	0.379	0.076	-0.016	0.003	-0.002
P_MKSHIFT	-0.015	0.066	-0.431	0.234	0.814	-0.004	0.178	-0.049	0.109	-0.215	0.006	0.009	-0.002
P_SAFEW	0.624	0.217	-0.060	0.180	-0.188	-0.233	-0.089	-0.329	-0.334	-0.364	-0.279	0.029	0.001
P_TOILET	0.811	-0.004	0.095	0.032	-0.040	0.015	0.104	-0.154	-0.184	-0.159	0.460	-0.160	-0.001
P_NOTEL	0.636	-0.013	0.021	-0.247	0.029	-0.017	0.599	0.261	-0.117	0.122	-0.216	-0.173	0.009
P_1316NOHI	0.872	-0.064	0.068	-0.092	0.004	0.084	0.206	0.109	-0.004	0.019	0.078	0.392	-0.013
P_POV_TR	0.862	-0.260	-0.050	0.038	0.029	0.009	-0.259	0.008	0.314	0.032	-0.056	-0.034	0.111
P_FOODTR	0.850	-0.275	-0.038	0.057	0.016	-0.008	-0.261	0.045	0.310	0.035	-0.096	-0.097	-0.105
P_FDSHORT	0.419	0.509	-0.329	0.314	0.021	0.102	-0.086	-0.159	-0.158	0.539	0.010	-0.005	-0.001
P_LABUN	-0.110	0.002	0.140	0.820	-0.259	-0.247	0.236	0.282	0.175	-0.044	0.034	0.005	0.003
P_VICT_CR	0.014	0.554	-0.408	-0.140	-0.388	0.380	0.126	0.032	0.370	-0.240	0.018	-0.016	-0.002

Correlations between variables and factors

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
P_CHILDTH	0.227	0.584	0.093	-0.190	0.168	-0.343	-0.327	0.543	-0.079	-0.081	0.053	-0.008	0.002
P_WM_DIED	0.121	0.158	0.561	0.254	0.205	0.690	-0.116	0.119	-0.128	-0.095	-0.097	-0.031	0.002
P_MALNOUR	0.043	0.452	0.604	-0.114	0.164	-0.255	0.161	-0.386	0.379	0.076	-0.016	0.003	-0.002
P_MKSHIFT	-0.015	0.066	-0.431	0.234	0.814	-0.004	0.178	-0.049	0.109	-0.215	0.006	0.009	-0.002
P_SAFEW	0.624	0.217	-0.060	0.180	-0.188	-0.233	-0.089	-0.329	-0.334	-0.364	-0.279	0.029	0.001
P_TOILET	0.811	-0.004	0.095	0.032	-0.040	0.015	0.104	-0.154	-0.184	-0.159	0.460	-0.160	-0.001
P_NOTEL	0.636	-0.013	0.021	-0.247	0.029	-0.017	0.599	0.261	-0.117	0.122	-0.216	-0.173	0.009
P_1316NOHI	0.872	-0.064	0.068	-0.092	0.004	0.084	0.206	0.109	-0.004	0.019	0.078	0.392	-0.013
P_POV_TR	0.862	-0.260	-0.050	0.038	0.029	0.009	-0.259	0.008	0.314	0.032	-0.056	-0.034	0.111
P_FOODTR	0.850	-0.275	-0.038	0.057	0.016	-0.008	-0.261	0.045	0.310	0.035	-0.096	-0.097	-0.105
P_FDSHORT	0.419	0.509	-0.329	0.314	0.021	0.102	-0.086	-0.159	-0.158	0.539	0.010	-0.005	-0.001
P_LABUN	-0.110	0.002	0.140	0.820	-0.259	-0.247	0.236	0.282	0.175	-0.044	0.034	0.005	0.003
P_VICT_CR	0.014	0.554	-0.408	-0.140	-0.388	0.380	0.126	0.032	0.370	-0.240	0.018	-0.016	-0.002



Contributions of the variables (%)

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
P_CHILDTH	1.304	25.526	0.732	3.380	2.770	12.545	13.180	37.766	0.865	1.111	0.775	0.031	0.016
P_WM_DIED	0.373	1.881	26.449	6.050	4.123	50.839	1.655	1.814	2.268	1.520	2.566	0.446	0.017
P_MALNOUR	0.047	15.282	30.654	1.217	2.640	6.955	3.208	19.108	19.818	0.981	0.070	0.004	0.016
P_MKSHIFT	0.006	0.328	15.631	5.136	65.169	0.002	3.912	0.313	1.648	7.794	0.008	0.035	0.017
P_SAFEW	9.904	3.522	0.298	3.050	3.466	5.779	0.969	13.861	15.381	22.341	21.050	0.372	0.007
P_TOILET	16.708	0.001	0.752	0.094	0.161	0.023	1.320	3.052	4.656	4.269	57.435	11.522	0.008
P_NOTEL	10.281	0.013	0.038	5.739	0.081	0.032	44.171	8.736	1.894	2.511	12.685	13.498	0.321
P_1316NOHI	19.337	0.311	0.394	0.796	0.002	0.756	5.243	1.529	0.002	0.062	1.645	69.190	0.734
P_POV_TR	18.903	5.076	0.212	0.135	0.082	0.009	8.283	0.008	13.626	0.178	0.843	0.509	52.135
P_FOODTR	18.363	5.658	0.122	0.300	0.026	0.007	8.367	0.257	13.276	0.207	2.495	4.255	46.667
P_FDSHORT	4.461	19.410	9.092	9.251	0.043	1.109	0.914	3.248	3.434	48.997	0.025	0.010	0.006
P_LABUN	0.309	0.000	1.644	63.019	6.591	6.501	6.833	10.174	4.235	0.320	0.317	0.010	0.047
P_VICT_CR	0.005	22.991	13.982	1.832	14.845	15.443	1.946	0.135	18.898	9.709	0.085	0.119	0.010

Annex 11 – List of Potential Explanatory Factors (PEF)

CODE	Description	Year	Level
HHs-PEF			
P_TREAT	% of HHs received treatment for sickness	2005	Village
P_GARBCOLL	% of HHs with access to garbage collection	2005	Village
P_TV	% of HHs with tv	2005	Village
P_VHS	% of HHs with vhs	2005	Village
P_PC	% of HHs with computer	2005	Village
P_REF	% of HHs with ref	2005	Village
P_ELECTIRO	% of HHs with electric iron	2005	Village
P_ELSLOVE	% of HHs with lpg/electric stove	2005	Village
P_WASHMACH	% of HHs with washing machine	2005	Village
P_MICROW	% of HHs with Microwave oven	2005	Village
P_PHONE	% of HHs with phone	2005	Village
P_AIRCON	% of HHs with Aircon	2005	Village
P_MOTORVEH	% of HHs with motorized vehicle	2005	Village
P_BUSINESS	% of HHs with business	2005	Village
P_CROPFGAR	% of HHs engaged in crop farming and gardening	2005	Village
P_POULTRY	% of HHs engaged in poultry and livestock raising	2005	Village
P_FORESTRY	% of HHs engaged in forestry	2005	Village
P_RETAIL	% of HHs engaged in wholesale and retail trade	2005	Village
P_TRANSCOM	% of HHs engaged in transport and communication	2005	Village
P_FISHING	% of HHs engaged in fishing	2005	Village
P_CONSTRUC	% of HHs engaged in construction	2005	Village
P_MINING	% of HHs engaged in mining and quarrying	2005	Village
P_MANUF	% of HHs engaged in manufacturing	2005	Village
P_CSPSERV	% of HHs engaged in CSP services	2005	Village
ind-PEF			
P_IP	% of Indigenous People	2005	Village
P_DISAB	% of disabled persons	2005	Village
P_60YSCID	% of members 60 years old and above with SCID	2005	Village
P_SOLOP	% of solo parents	2005	Village
P_OFW	% of Overseas Filipino Workers	2005	Village
P_FAMPLAN	% of couples engaged in family planning	2005	Village
P_LIT10	% of literate 10 years old and above	2005	Village
P_BOARD	% of board passers	2005	Village
P_COMORG	% of people with Community Organization	2005	Village
muni-PEF			
AGRODEAL	Agrodealers (#/municipal population in 2000)	2003	Municipal
FISHPOND	Fishponds distributed (#/municipal population in 2000)	2003	Municipal
CATTLE	Cattle (#/municipal population in 2000)	2003	Municipal
CARABAO	Carabao (#/municipal population in 2000)	2003	Municipal
GOAT	Goats (#/municipal population in 2000)	2003	Municipal
HORSE	Horses (#/municipal population in 2000)	2003	Municipal
SWINE	Swines (#/municipal population in 2000)	2003	Municipal
CHICKEN	Chickens (#/municipal population in 2000)	2003	Municipal
TURKEY	Turkeys (#/municipal population in 2000)	2003	Municipal
GEESE	Geeses (#/municipal population in 2000)	2003	Municipal
DUCKS	Ducks (#/municipal population in 2000)	2003	Municipal
DOG	Dogs (#/municipal population in 2000)	2003	Municipal
HANDTRACT	Hand tractors (#/municipal population in 2000)	2003	Municipal
FARMTRACT	Farm tractors (#/municipal population in 2000)	2003	Municipal
MUDBOAT	Mud boat Ptiller (#/municipal population in 2000)	2003	Municipal
TOOTH_	Tooth Harrows (#/municipal population in 2000)	2003	Municipal
PUMP_	Water Pump/STW (#/municipal population in 2000)	2003	Municipal
SWIP	Small Water Impounding Project (#/municipal population in 2000)	2003	Municipal
PISOS	Pump Irrigation System Open Surface (#/municipal population in 2000)	2003	Municipal
SFR	Small Farm Reservoir (#/municipal population in 2000)	2003	Municipal
SOLARDRIER	Solar Driers (#/municipal population in 2000)	2003	Municipal
FLATBEDDR	Flat bed Driers (#/municipal population in 2000)	2003	Municipal
MECHDRIER	Mechanical Driers (#/municipal population in 2000)	2003	Municipal
RICEMILL	Rice Mill (#/municipal population in 2000)	2003	Municipal
CORNMILL	Corn Mill (#/municipal population in 2000)	2003	Municipal
RICETRESH	Rice Trhesher (#/municipal population in 2000)	2003	Municipal
CORNSHELL	Corn Sheller (#/municipal population in 2000)	2003	Municipal
WAREHOUSE	Warehouse (#/municipal population in 2000)	2003	Municipal
ABACSTRIP	Abaca Stripper (#/municipal population in 2000)	2003	Municipal
COF_HAUL	Coffee Hauler (#/municipal population in 2000)	2003	Municipal
MPOS	MPOS (Municipal Program Officer) (#/municipal population in 2000)	2003	Municipal
MINIWH	Mini-warehouse / Bodega (#/municipal population in 2000)	2003	Municipal
envi-PEF			
P_SHRUBS	Percentage of shrubs	2001	Village
P_CLOSED	Percentage of closed canopy forest	2001	Village
P_GRASSES	Percentage of grasses	2001	Village
P_OPEN	Percentage of opened canopy forest	2001	Village
P_WATER	Percentage of water	2001	Village
P_IRRIGATE	Percentage of irrigated agriculture	2001	Village
P_RAINFED	Percentage of rainfed agriculture	2001	Village
P_OIL_PALM	Percentage of oil palm plantation	2001	Village
P_BUILT_UP	Percentage of built-up area	2001	Village

Annex 12 – Significant correlations PEF-M_{endo} at provincial level

Variables significally (α=0.05) correlated to endogenous marginality (M_{endo})

Positive correlation

Code	Description	r (Pearson)
P_IP	% of Indigenous People (village)	0.49
P_CROPFGAR	% of HHs engaged in crop farming and gardening	0.40
CARABAO	Carabao (#/municipal population in 2000)	0.24
CORNSHELL	Corn Sheller (#/municipal population in 2000)	0.23
CORNMILL	Corn Mill (#/municipal population in 2000)	0.23
GOAT	Goats (#/municipal population in 2000)	0.23
P_OPEN	% of opened canopy forest in surrounded environment	0.22
P_FISHING	% of HHs engaged in fishing	0.20
SFR	SFR (#/municipal population in 2000)	0.20
PISOS	PISOS (#/municipal population in 2000)	0.19
P_FORESTRY	% of HHs engaged in forestry	0.15
DOG	Dogs (#/municipal population in 2000)	0.15
RAINUP	Rainfed upland rice production (MT/municipal population in 2000)	0.13
DURIAN	Durian production (MT/municipal population in 2000)	0.13

Negative correlation

Code	Description	r (Pearson)
P_TV	% of HHs with tv	-0.54
P_VHS	% of HHs with vhs	-0.53
P_MIG	% of migrants (village)	-0.49
P_REF	% of HHs with ref	-0.48
P_ELECTIRO	% of HHs with electric iron	-0.47
P_FAMPLAN	% of couples engaged in family planning	-0.47
P_MOTORVEH	% of HHs with motorized vehicle	-0.46
P_ELSLOVE	% of HHs with lpg/electric stove	-0.46
P_RETAIL	% of HHs engaged in wholesale and retail trade	-0.44
P_LIT10	% of literate 10 years old and above	-0.43
P_TRANSCOM	% of HHs engaged in transport and communication	-0.43
P_WASHMACH	% of HHs with washing machine	-0.41
P_MICROW	% of HHs with Microwave oven	-0.40
P_PC	% of HHs with computer	-0.39
P_OFW	% of Overseas Filipino Workers	-0.37
IRR_RICE	Irrigated rice production by head (MT/municipal population in 2000)	-0.33
P_BOARD	% of board passers	-0.33
P_PHONE	% of HHs with phone	-0.32
P_AIRCON	% of HHs with Aircon	-0.31
AGRODEAL	# of agrodealers/municipal population in 2000	-0.29
P_IRRIG	% of municipal area served by irrigation projects	-0.29
MECHDRIER	# of mechanical driers/municipal population in 2000	-0.28
HANDTRACT	# of hand tractors/municipal population in 2000)	-0.27
P_CONSTRUC	% of HHs engaged in construction	-0.27
P_MANUF	% of HHs engaged in manufacturing	-0.25
MINIWH	Mini-warehouse / Bodega (#/municipal population in 2000)	-0.24
SWINE	# of swines/municipal population in 2000	-0.24
FRUIT_VEG	Fruits and Vegetables production (MT/municipal population in 2000)	-0.23
P_CSPSERV	% of HHs engaged in CSP services	-0.22
P_GARBCOLL	% of HHs with access to garbage collection	-0.22
P_OIL_PALM	% of oil palm plantation in surrounded environment	-0.21
P_MINING	% of HHs engaged in mining and quarrying	-0.21
MPOS	# of MPOS/municipal population in 2000	-0.19
DUCKS	# of ducks/municipal population in 2000	-0.18
P_BUILT_UP	% of built-up area in surrounded environment	-0.16
P_60YSCID	% of members 60 years old and above with SCID	-0.16
P_SOLOP	% of solo parents	-0.14
P_COMORG	% of people with Community Organization	-0.14
P_RAINFED	% of rainfed agriculture in surrounded environment	-0.14

Annex 13 – FCA notions and interpretation rules

It is the work of Benzécri (Benzécri, 1973; Benzécri, 1992) that allowed the emergence of the method. The initial method has subsequently been adapted especially by Greenacre (1984) and Lauro and D'Ambra (1984). The FAC studies the association between two variables and generally deals with categorical data but it is possible to use this method on quantitative data. In the latter case, FAC requires then to use data that are integers, all positive and grouped in a *contingency table*. A contingency table is constituted of n individuals (e.g. spatial units) (row) and p quantitative variables (columns) (Godard, 2007). In a contingency table, the sum on lines must be meaningful as well as the sum on columns.

The initial input of a FCA is a contingency table in other words a matrix (i x j) of raw values (effectives). Let's note that matrix C:

$$C = \begin{bmatrix} n_{1,1} & n_{1,2} & \cdots & n_{1,j} \\ n_{2,1} & n_{2,2} & \cdots & n_{2,j} \\ \vdots & \vdots & \ddots & \vdots \\ n_{i,1} & n_{i,2} & \cdots & n_{i,j} \end{bmatrix} \tag{A13.1}$$

where $n_{i,j}$ is the number of individuals i concerned by the variable j.

Classically, effectives are standardized (transformed by frequencies) (Cox, 2005). The number of the number of individuals $n_{i,j}$ is replaced by:

$$f_{i,j} = \frac{n_{i,j}}{\sum_{i,j} n_{i,j}} \tag{A13.2}$$

The matrix of frequencies M (I x j) takes the following form:

$$M = \begin{bmatrix} f_{1,1} & f_{1,2} & \cdots & f_{1,j} \\ f_{2,1} & f_{2,2} & \cdots & f_{2,j} \\ \vdots & \vdots & \ddots & \vdots \\ f_{i,1} & f_{i,2} & \cdots & f_{i,j} \end{bmatrix} \tag{A13.3}$$

The sums on the rows and columns are denoted as follows:

$$f_{i,.} = \sum_j f_{i,j} \tag{A13.4}$$

$$f_{.,j} = \sum_i f_{i,j} \tag{A13.5}$$

Each line *i* has a *row-profile* described by the following vector:

$$P_i = \{f_{i,1}, f_{i,2}, \ldots, f_{i,j}\} \tag{A13.6}$$

Similarly, each column *j* has a *column-profile* described by the following vector:

$$P_j = \{f_{1,j}, f_{2,j}, \ldots, f_{i,j}\} \tag{A13.7}$$

FCA's aim is to study the relationship between two variables which is to study the difference between the observed data and a state of independence (or *average profile* or *theoretical situation*). Two variables are independent if:

$$\forall i \ \forall j \quad f_{i,j} = f_{i,..} \times f_{.,j} \tag{A13.8}$$

If the differences are equal to zero, all observed values are equal to the theoretical situation of independence and there is no similarity or opposition to observe. In other words, all the *row-profiles* on the one hand and the entire *column-profiles* on the other hand are equal to the corresponding average profile.

To measure the distance between two individuals, we use the Chi-2 metric (χ^2) (instead of the classical Euclidean distance[130]). The χ^2 distance between two row-profiles P_i and $P_{i'}$ is defined by:

[130] We use the χ^2 metric rather than the Euclidean metric because (i) with the χ^2 metric, distance between two lines (resp. columns) does not depend of the weights of columns (resp. lines) and (ii) the metric of the χ^2 has the *distributional equivalence* property: if one includes, for example, two lines modalities, distances between column-profiles or between other line-profiles remain unchanged (Carpentier, 2005). χ^2 distance is in fact a weighted Euclidean distance (Cox, 2005).

$$d^2(P_i, P_{i'}) = \frac{\sum_j \left(f_{ij} - f_{i'j}\right)^2}{f_{.,j}} \tag{A13.9}$$

The main output of FCA, the one that is mostly relevant for this study, is a graphical representation on a two-dimensional plane, giving a synthetic representation of the structure of the data points, and allowing the comparison with the hypothetical situation of independence between the lines and the columns. Therefore graphs are the 2D-representation of clouds of initial individuals (rows) and variables (columns), as the distances are Euclidean distances rather than χ^2 distances. As in PCA, orthogonal axes (factors) are defined by eigenvalues and eigenvectors and are positioned according to the directions of greater dispersion in the cloud of points.

One always study the plane created by axis 1 and 2 (Fig. A13.1), and sometimes the ones created by axis 1 and 3 or 2 and 3 as well, but rarely more. Here are some interpretation's rules (Benzécri, 1992):

(i) distance from the origin
The origin of the graph, e.g. the coordinates (0,0), is also called c*enter of mass*. This corresponds to the *average profile*. It is from this point that the gap is calculated. The more a point is distant from the centre, the more it deviates from the average profile.

(ii) interpretation of the distance within points of a same cloud
One should only consider the positions relative to an axis of the points belonging to a same cloud. Two points close on the graph will have a similar profile.

(iii) angular interpretation between points belonging to different clouds
It is extremely uncertain to interpret the proximity between two points from two different clouds. However we can interpret the *angle* (α) between a row-point and a column-point following some simple rules:

- if the angle between two points is acute (< 90º), the two characteristics for which the points stand for are correlated;
- if the angle is obtuse (> 90º), the points are negatively correlated ;
- if there is a right angle, the points do not interact.

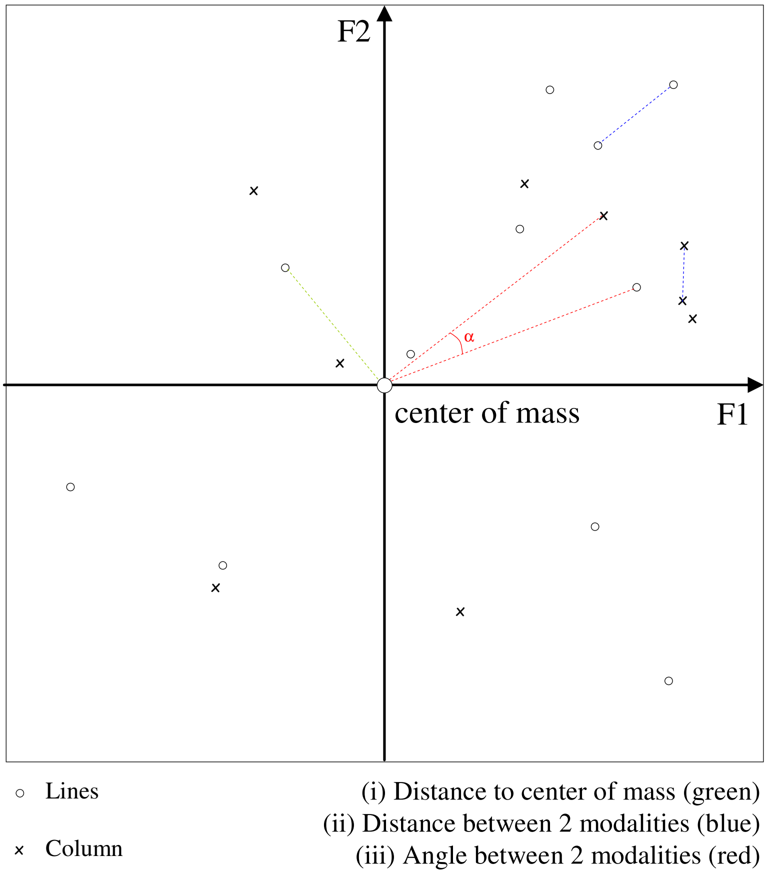


Fig. A13.1 – Distances and angles in F1-F2 plane